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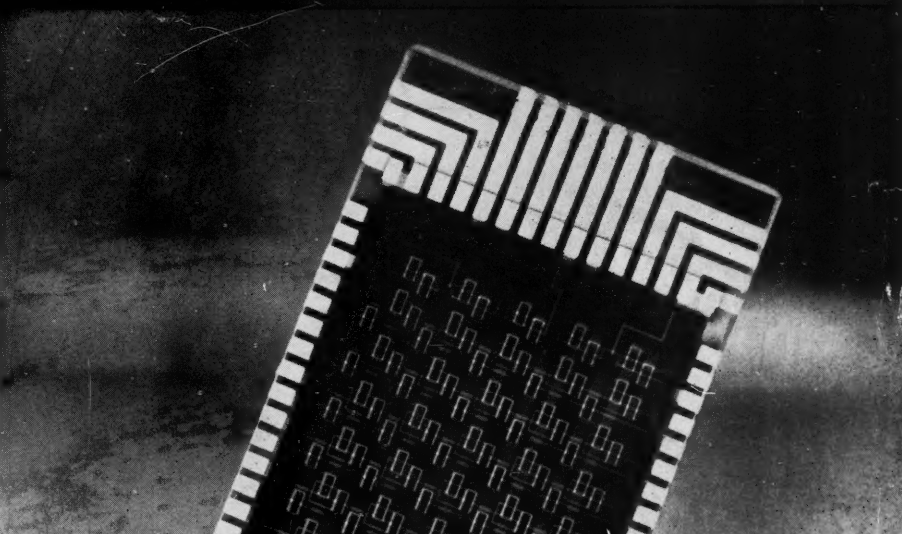
MATION

ORS, AND THEIR CONSTRUCTION,

INCLUDING AUTOMATION



Cryogenic Thin-Film Memory Plane

The Scientific Extension of the Human Intellect

Delay Lines

The New Electronics Industry, Education, and the Midwest

News of Computers and Data Processors: ACROSS THE EDITOR'S DESK

FEBRUARY 1961

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COMPUTERS *and* AUTOMATION

COMPUTERS AND DATA PROCESSORS, AND THEIR CONSTRUCTION, APPLICATIONS, AND IMPLICATIONS, INCLUDING AUTOMATION

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The Honeywell Word:

How it contributes to the flexibility and efficiency of Honeywell EDP Systems

The basic unit of information in Honeywell Electronic Data Processing Systems is the Honeywell Word. The Honeywell Word contains 48 bits representing information, plus additional bits for checking purposes.

Though the checking function is an important feature, this discussion is primarily concerned with the 48-bit information portion of the word.

This 48-bit portion is extremely versatile. As a data word, it may represent information in the form of decimal or binary numbers, alphabetic characters or special symbols. As an instruction word, it causes the System to carry out specific data processing functions.

Data words Let's look at data words first. Honeywell Systems can treat a word as a pure binary number consisting of a sign and 44 bits, or 48 bits without a sign (a positive sign is normally represented by four binary ones and a negative sign by four binary zeros).

DATA WORDS

TYPE	EXAMPLE											
DECIMAL	±	0	9	8	7	6	5	4	3	2	1	0
ALPHANUMERIC	R	O	B	I	N	S	O	N				
COMBINATION DECIMAL AND ALPHANUMERIC	1	7	4	P	A	R	K		A			
BINARY	±	(44 Binary digits)										
FLOATING POINT	±	EXPONENT (7 Binary Digits)	MANTISSA (40 Binary Digits)									

The 48 bits may be considered as four-bit groups representing decimal information. Hence a word may contain 12 decimal digits or 11 digits plus a sign. Extensive analysis of commercial data helped to determine the size of the Honeywell Word. A curve showing the frequency of use of numbers of various sizes indicates 10 to 11-digit numbers as being most common. In the economics of computer design, a word containing 11 digits (plus sign) is thus of optimum size.

Alphanumeric information takes the form of six-bit groups, resulting in as many as eight alphabetic (or six-bit numeric) characters in a word. Four-bit and six-bit groups, incidentally, can be combined in a word. In addition, Honeywell 800 has optional floating-point arithmetic logic wherein the 48-bit word is treated as a 40-bit mantissa, a seven-bit exponent and a one-bit sign. The floating-point option includes both binary and decimal arithmetic.

Instruction words Three-address instruction logic, because of its speed and programming advantages, is standard in Honeywell EDP Systems. Honeywell instruction words are interpreted fundamentally as four groups of 12 bits each. The first group represents a command code or function to be performed. The remaining three groups represent address groups normally used to designate the location of operands and results. In certain instructions, however, they may contain special information — such as the number of data words to be transferred, the number of decimal or binary digits to be shifted, or the number of words to be edited.

INSTRUCTION WORD

OPERATION CODE	ADDRESS A	ADDRESS B	ADDRESS C
12 Bits	12 Bits	12 Bits	12 Bits

Programming flexibility Exceptional programming flexibility is achieved in several ways. One of these is the ability to specify the location of data relative to other data without relying on specific or absolute addresses (indexing). Masking permits the selection and manipulation of information units smaller than a word. A special type of instruction called a Simulator Instruction permits any routine to be treated as if it were a built-in instruction.

Orthotronic control Still another special word in the Honeywell System vocabulary is called an Ortho word. Ortho words are generated by the System and appended to the end of each record as it is recorded on magnetic tape. Unique to Honeywell Systems, these Ortho words are an automatically generated mathematical image of the information in the record. If portions of the record should—for any reason—be unreadable at some later time, Orthotronic control not only assures detection, but permits the original information to be reconstructed by the system.

Get the whole story The flexibility and efficiency of the Honeywell word are indicative of the many advances in logic and engineering that are typical of Honeywell equipment. To get full descriptive information on either or both Honeywell 800 and Honeywell 400 Transistorized Data Processing Systems, just write: Honeywell Electronic Data Processing Division, Wellesley Hills 81, Massachusetts.

Honeywell

H *Electronic Data Processing*

Readers' and Editor's Forum

FRONT COVER: CRYOGENIC THIN-FILM MEMORY PLANE

The front cover shows an experimental cryogenic thin-film memory plane. It consists of 135 cryotron devices built up in a 19-layer "sandwich." It has been successfully duplicated many times by automatic control techniques at International Business Machines Corp. The memory plane is about the size of a large postage stamp, and stores 40 separate bits of information in 120 of its cryotrons. Of the remaining 15 cryotrons, 10 permit access to the stored bits of information; the other five are "in-line" cryotrons which switch bits of information from one memory plane to another.

Cryogenics is the branch of solid-state physics which is concerned with the properties of materials and devices at temperatures of about 450°F below zero. At such low temperatures certain metals permit electric current to flow endlessly, without additional power, in devices that can be used to perform logic and to store information in a computer memory. Cryotrons are devices in a cryogenic computer which will perform addition, subtraction, multiplication, division, logical switching operations, and amplification.

A key to this new development is the special technique which permits accurate duplication of devices. By means of this technique, microscopically thin layers of metals and insulating materials are automatically deposited on a glass substrate.

The equipment used for deposition allows each layer of a metal or insulator to be sequentially deposited through 17 microscopically adjusted masks, or perforated metal sheets. The masks are changed automatically like records in a juke box and are held in a large metal cylinder operating under high vacuum. Once the masks have been properly aligned, the process automatically produces duplicate superconducting memory planes with similar electrical and mechanical characteristics.

COMPUTERS IN INSPECTION FOR DISARMAMENT

I. From R. L. Turnbow
Modesto, Calif.

I am currently a student at Stanislaus State College in Turlock, California. In one of my courses, "Economics of Free Enterprise," I am doing a term paper.

My instructor, Mr. E. J. Haga, showed me the November 1960 issue of **Computers and Automation,** where the article, "The Social Responsibilities of Computer People and Peace Engineering," appeared.

In this article, you noted a bill, H.R. 9305, and a specific provision of it, "The Agency shall undertake programs to carry out the purpose of this act, including among others, programs . . . for development and application of communications and advanced computer techniques for analyzing the problems involved in inspection of national budgets and economic indicators as they bear upon disarmament inspection systems."

This provision is the topic I have chosen for my term paper.

As this is an entirely new field to me, I would more than appreciate any and all aid you could give me in its development, or references to people who know about this area or have written about it.

I am also writing for a copy of the House Debate on Bill H.R. 9305, and to Congressman Charles E. Bennett, who introduced the bill.

II. From the Editor

I am very glad that you have chosen for your term paper the interesting topic of the application of computers to inspection of national budgets and economic indicators as they bear upon disarmament inspection.

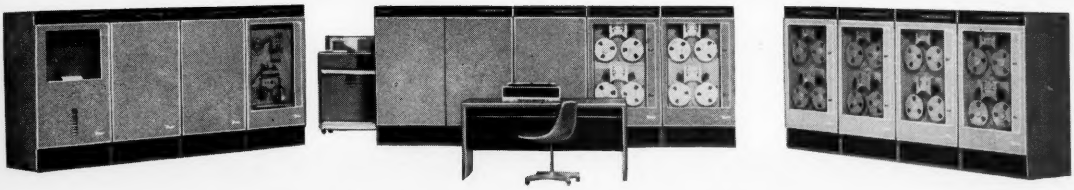
The book which I believe you should begin with is "Inspection for Disarmament" edited by Seymour Melman, Columbia University Press, New York, 1958, 291 pages, particularly the paper "The Control of Disarmament by Fiscal Inspection" by Jesse Burkhead, pp. 75-84 in that book. I would also suggest that you take a look at the other papers in the book.

The first problem as I see it is proof by a nation that it is honestly adhering to disarmament agreements and not spending more than an allowed sum for military expenses. The second problem as I see it is detection of attempted concealment by a faction within a nation that the nation is spending money for armaments contrary to international agreement.

In the case of the first aim, proof of full conformity with agreement, we can assume *full cooperation* in obtaining figures from all parts of the government. Then it seems to me it would be possible rather easily to set up a computer program for verifying say 1,000 different tests every 3 months or so on figures and information coming into the system.

In the case of the second aim, detection of illegal nonconformity by a faction not the majority of a government, it seems to me that pretty much the same plan of checking data, applying great varieties of tests to data coming in, would succeed in focusing on spots where unexplained amounts were occurring. This kind of problem is quite similar to auditing to prevent dishonesty. References on accounting and auditing and articles related to computer applications in this field would be relevant.

I hope these suggestions will be of use to you.



The Scientific Extension of the Human Intellect

Dr. Simon Ramo
Executive Vice President
Thompson Ramo-Wooldridge, Inc.
Los Angeles, Calif.

(Based on a talk "The Scientific Challenge of the New Age" by Dr. Ramo before the 65th Annual Congress of American Industry, Dec. 7, 1960, New York)

We all now realize that we are in rapid transition to a new, highly technological society. The needs of the new age will present many challenges to the scientist and engineer. However, these challenges are as nothing compared with the challenges that scientific advance will offer to society as a whole.

Gross Imbalance

Already a gross imbalance exists between technological and sociological progress. Will the transition to the new society be orderly or chaotic? Civilization must adapt; the impact of technology must be absorbed. We have no take-it-or-leave-it choice. The expanding, increasingly fast-paced, complex, and interacting world urgently requires solutions to the problems of its physical operations of production, communication, transportation and resources control and distribution. Because technological creativity is able to do so, it is furnishing the answers. A match between need for solutions and supply of solutions exists. Science and society have finished their courtship and are now getting married. Will it be wedded bliss, with the offspring sources of pride and joy, or will it be a shaky, unstable partnership?

The H-bomb is the established symbol of the growing disparity between rapid scientific change and the lagging adjustment of society. We have learned how to release quickly such tremendous amounts of energy as to destroy a civilization that has not yet produced accepted, respected conduct to preclude the use of force. But the bomb is not the best example. It emphasizes the military side of the world's problems. Even if no war or peace issue existed, disorder threatens if and as we fail to assimilate the technological revolution.

Outer Space

Outer space is the newest symbol of the influence of technology on world affairs, and it brings us headlong into a striking array of challenges in the making of unprecedented national and international arrangements. What is the role of private, free enterprise? Where do national boundaries end? How will the world judge the contest for the limited radio spectrum as satellite repeaters make possible the wholesale interconnection of communications into a single, endless, world-wide web? What bodies and agreements will decide how space technology, meteorology, and nuclear energy will be applied, not only to predict but ultimately to influence the earth's weather?

Nuclear energy developments and outer space conquest will change our way of life. So also will chemical and biological discoveries. Large stretches in life expectancy and flights to and even colonization of other planets may conceivably occur before the twentieth century is over.

But meanwhile, there is another area of science and technology already emerging, I believe, as the most influential and important for the next decade or two. It will use the greatest fraction of our technical resources, will be most determining in international competition, war or peace, and is the most substantive example of the inequality between technological and social advance. A discussion of this area will help us to understand the nature of the coming technological society.

Intellectual Pursuits Assigned to Electronic Machines

The rest of this century will see the gross extending of the human intellect and senses by application of science and technology. In every intellectual pursuit in which man is engaged, whether in the professions, in production control, in the military, in teaching everywhere,—when we break down what we do with our minds, we find a part that is best assigned to electronic machines. We reduce the intellectual activity to stored and incoming information, to logical processes, sorting, deciding. The part that is well understood, that involves rates and quantities too large for the human mind, we assign to the machine. This raises the human intellect to the more complex aspects of the intellectual task, the aspects above the routine work of the electronic partner.

Intellectronics

Obviously, we are not talking about "automation," the replacement of the factory worker. The words "automatic control" and "computer" are also inadequate and narrow. We are speaking of a new man-machine partnership in the powerful domain of the intellect. I like the new word "intellectronics," because it reflects extending the intellect by electronics, suggests a broad technological area, and portends a great industry. (Anyone who is inclined to doubt that the grand-scale extending of the human intellect, intellectronics, will in a decade or two become our largest, most significant activity, takes the risk of having his brains listed among the first needing extension!)

The intellectual activity we call science and en-

gineering has already been revolutionized by intellectronics. The intercontinental ballistic missiles, if the brains of the designer were not extended by electronics, would be many years away. Thousands of flights would be needed in a clumsy, trial-and-error approach to optimizing the design. Instead, mere dozens of actual flights have been sufficient to finalize the engineering and prove out the design. The thousands of other trial flights took place in the simulation laboratories; and the selection of the right combination of parameters out of the myriad of possibilities—too huge a task for human comparison and sorting alone—was made by a man-machine, intellectronics partnership.

Practice of Law

Picture the practice of law in the technological world of a decade from now—or, at least, law as it might be practiced if technology is used to the fullest. Every practicing attorney would have in his office means for convenient electronic connection to a huge national central repository of facts, rules, procedures, and precedents. For the routine filing of papers, records, and petitions, he or his assistant would introdduce his data into the intellectronics system, a technique his legal training would include. Any conflict, omission, inconsistency, or other shortcoming of his work, any problems with the law or the existing records or the claims of another, would be automatically, instantly displayed to him. And it would cover not just the few possibilities an unaided human brain might have handled, given enough time. It will scan, select, reject, and present the result of the equivalent of the work of thousands of searchers covering many decades of records over the entire nation in a split second.

It elevates the lawyer's intellect to the more complex intellectual tasks, giving him better tools with which to work. It alters a substantial fraction of legal practice.

Even on the nonroutine legal processes, the attorney, in the coming intellectronic age, will be able to consult with the equivalent of a host of informed fellow attorneys. His request to the system for similar cases will yield an immediate response from the central store, together with questions and advice filed by other attorneys on those similar cases—even as he will add his facts and guidance into the system for future use by all.

Consultations for Physicians

This concept of man-machine partnership on difficult intellectual tasks is made clearer by considering the physician's potential approach in the latter part of the century. He also will routinely introduce his data on a given patient to the network of "consultative wisdom." The system will quickly react to give him some key portions of what would have been the results of many consultations with other physicians. It will call out questions he may not have asked himself. It will give statistical probabilities of relative effectiveness of various treatments with numerous variations to account for the corollary possibilities.

Notice that with diseases—their symptoms, characteristics, treatments—all nationally monitored, the statistical approach to medical practice takes on an entirely new stature. New branches of medicine will emerge based on the practical possibility of studying cause and effect on a large-scale, yet rapid, basis with detailed up-to-the-minute facts on the relationship of ailment to treatment covering many thousands of cases.

Partnership of Machine and Man

We observe, from both the legal and medical examples, that merely extending man's memory through electronics, creating a library that is both mammoth yet accessible with electronic speed, offers radical advantages in achieving excellence of professional activity. But the memory extension is far from the total effect. The properly designed system does some of the processing of the library's information. It handles the lower intellectual tasks of the first sorting, categorizing, comparing, selecting, questioning. These tasks, done well, require ideally that tremendous volumes of data be processed quickly. The machine member of the partnership does this high-quantity, high-rate part of the intellectual job, allowing the higher intellect of the human partner to concentrate on the more subtle, less clearly defined, less routine conclusion drawing, decision making, judgment aspects of the intellectual task.

Let us continue our quick look at what man is today engaged in doing with his remarkable intellect, and we shall see much evidence to suggest that too often the task is intellectually, qualitatively beneath him, while oftentimes too much for him quantitatively. The coming technological age will be characterized by a much better match between man's intellectual capabilities and the assigned thinking role, thanks to the concept of man-machine partnership in mental activity.

Keeping Track in Banking

Take, for instance, money and banking, and the whole process of keeping track of who owns what, where it is, and who owes whom. How absurd that millions of people are engaged all day in putting little marks on pieces of paper, reading them off, and reintroducing similar ones on other pieces of paper, without much need for deliberation in the process! This is as unsuitable for the human intellect as pulling huge stone blocks to build the pyramids was to human muscles. Currency and coins will be for the rural areas alone in a few decades. Even checks, and most other of today's forms of human record originations, will be extinct. If you buy a necktie or a house, your thumb before an electronic scanner will identify you, and the network will debit your account and credit the seller. The system will automatically do the routine accounting, call out violation of rules or problems in the transaction, and list alternatives. Again, the machine partner does the brainwork when it is simple but high-quantity and also acts to aid the human partner for the more difficult aspects. (Of course, occasionally a transistor burning out in Kansas City might accidentally wipe out someone's bank balance in Philadelphia. One has to expect some continued dangers and risks in life in the period ahead, though they will likely be new ones.)

Guidance of Moving Traffic

Hardly a better example can be found of the urgent

need for man-machine, intellectronics partnerships to handle intellectual tasks than the control of things moving in the sky and on the ground. For safety and reliability, at the airports, in the airways, and on our surface freeways and streets, it is clear that human brains unaided (whether a pilot, an airport controller, or a Los Angeles automobile driver) cannot integrate all the data and process it fast enough to make decisions leading to the largest, smoothest, safest use of the artery. Intellectronic systems are needed in which facts as to nature, quantity, rate of change, spatial spread, and interconnection of traffic are all sensed accurately and continuously over wide areas, automatic predictions are made and compared as to consequences and as to alternate directions to influence the flow. Not only will the handling of planes and the role of the pilot be drastically changed with time, but it is not ridiculous to imagine automobiles of the future which go onto electronic control if directed onto crowded freeways, the driver limited to pushing a button for the number of his chosen exit.

Our factories and refineries already have begun to recognize the limitations of reliance on the unextended human intellect for control of the operation, even as has the military. Too many things to keep track of, too rapidly changing a situation, too much processing of facts and possibilities. Since much of the intellectual process is clear, only involving high quantities and rates, the machine partner, properly integrated, both relieves and suitably elevates the human intellect and makes for more efficiency, higher profits, or greater security.

World-Wide Integration

It should be clear from these examples that most of the physical operations of the world are candidates for passing under intellectronics systems control. But also much of the operations involve world-wide integration and interconnection. Many millions of human minds and their extensions, in the form of signals and data and information collection, will be connected together, often crossing national and language barriers. No wonder one of the most interesting of intellectronics areas is in machine translation of natural language. Again, the machine member of the team handles the high volume, cruder intellectual task. It produces rough translations, identifies double meaning possibilities, weighs alternative meanings based on what preceded and followed—it assists and "sets up" for its more intellectual human partner.

What is less clear is that the nature of language and its function will probably change drastically in the years ahead. The machine partners in the universal intellectronics systems of the future will want the facts and the rules in the most efficient language possible. They will create pressure for a common, purely informational, completely logical and consistent kind of language. The technological age may force on the world a real measure of language reform or at least a new common language for some functions of human endeavor.

Education of Human Beings

The most truly intellectual activity of all must be the education of the human brain. We are approaching a crisis in education because the needs of a more complicated, more populous world are increasing rapidly while our ability to place human resources behind the educational system is decreasing. But an intellectronics system of the future can make a ten- or hundred-fold change in the effectiveness of education. The human educator can have tools analogous to the physician's x-rays and electrocardiographs. The routine material can be presented by machine, leaving the more difficult concepts for the higher intellect of the human educator. Programmed machines can stimulate the thinking of the student, alter the presentation, speed it up, slow it down, add more explanations, skip steps—all automatically as a result of continually monitoring the student's responses to questions.

An intellectronics system can remember the progress of millions of students, compare their tested learning with the plan, measure and report deviations. Yet, the same system can immediately recognize an individual student, give him an accelerated or special presentation or test, all by a virtually instantaneous scan of his record and a following of rules put in by wiser human educators as to how to modify the course in relation to the individual record.

Such a future system will involve new large industries employing experts in the subjects to be taught, the design of programs, devices, and systems. It will also call for new professional groups within an augmented educational profession to provide for statistical study, planning, diagnosis of problems, and generally the matching of the synthetic intelligence of the machine with the human brain to achieve the fullest utilization of both human and machine resources in an educational system suited to the coming technological age.

Citizen Participation in National Decisions

These sketchy portrayals of the nature of the coming technological age should not imply one grossly wrong conclusion: that the future world will be automatic, robot-like, every human being only a constrained cog in a tight machine, freedom of spirt and expression and democracy dead. On the contrary, if we should so desire, intellectronics makes possible a degree of citizen participation in policy and goals, both discussion and decision, unthinkable today. Consider only that our Congresses, our policy bodies, could have their deliberations open to millions in their homes, and further—the added future possibility—the entire nation could vote by push-button from their homes on any fraction we might choose of all issues. The result would be known to all instantly. I am not suggesting that it would be practical to seek more than a small, partial attainment of all that technology could be employed to provide in this area. But the future could be one in which a much greater portion of all people are up to date, understanding, interested in, anxious to participate and indeed do participate in determining the aims and priorities of our lives and the manner of reaching our objectives.

In summary, a basic characteristic of the future technological society is that brainpower will deter-

mine the course of the world, the stature and influence of nations. But total brainpower will be the sum of natural human intellectual activity and synthetic man-made intelligence. The machine partner will possess less mentality but will have greater capacity for the big, lower-grade load.

Disparity Between Scientific and Sociological Advance

Since the real bottleneck to progress, to a safe, orderly, and happy transition to the coming technological age lies in the severe disparity between scientific and sociological advance, we must now ask the key question: Will intellectronics aid in removing the imbalance? Obviously, not directly. The challenging intellectual task of accelerating social progress is for the human mind, not his less intellectual electronic partner. But perhaps there is a hope. If the machines do more of the routine, every-day intellectual tasks, man will be elevated to the higher mental domains. He will have the time, the intellectual stature, and hence the inclination to solve the world's social problems. We must believe he has the inherent capability.

MANUSCRIPTS

WE ARE interested in articles, papers, reference information, and discussion relating to computers and automation. To be considered for any particular issue, the manuscript should be in our hands by the first of the preceding month.

Articles: We desire to publish articles that are factual, useful, understandable, and interesting to many kinds of people engaged in one part or another of the field of computers and automation. In this audience are many people who have expert knowledge of some part of the field, but who are laymen in other parts of it.

We look particularly for articles that explore ideas in the field of computers and automation, and their applications and implications. An article may certainly be controversial if the subject is discussed reasonably. Ordinarily, the length should be 1000 to 3000 words. A suggestion for an article should be submitted to us before too much work is done.

News and Discussion: We desire to print news, brief discussions, arguments, announcements, letters, etc., anything, in fact, if it is not advertising and is likely to be of substantial interest to computer people.

Payments: In many cases, we make small token payments for articles, if the author wishes to be paid. The rate is ordinarily ½c a word, the maximum is $15, and both depend on length in words, whether printed before, etc.

All suggestions, manuscripts, and inquiries about editorial material should be addressed to: *The Editor,* COMPUTERS *and* AUTOMATION, *815 Washington Street, Newtonville 60, Mass.*

Delay Lines and Electromagnetic Filters

Morton Fassberg, President
ESC Electronics Corp.
Palisades Park, N. J.

(From a talk before a group of security analysts, November 30, 1960)

The principal products of this company are precision delay networks which account for about 90 per cent of the company's total volume of sales. Other products include electro-magnetic filters and wide band video transformers.

Delay networks, or, as they are widely known, delay lines, are specially created for specific situations to do definite jobs. Once a prototype, or successful sample, has been produced, then others of identical structure are made under the most precise conditions in whatever numbers the user may wish. To borrow from a current phrase, the priceless ingredient is imagination. This is more than what we commonly call "know-how." It requires creativity.

What is a Delay Line?

It is not easy to arrive at a simple definition of a delay line in one-syllable words. Technicians shudder at the thought of such an effort because there are so many nuances in electronics and especially in the custom-designing of delay lines. A colloquial description of a delay line is less accurate than a technical exposition, but it may be more generally useful.

A good way to get a glimpse at what a delay line does, is to consider the use of delay lines at airports which use aircraft identification in landing systems. During the five years in which delay lines have come into use at airports, it is now possible to identify five times as many planes in the sky, at one time, than was possible just a few years ago. Assigned pulses from individual planes are decoded through delay lines and thus more planes can be identified on the ground. This, of course, means better communication between ground and air, better control, and greater safety. The delay lines may be considered as locks. The impulses would be the keys. Just as keys fit locks and open them, so electrical impulses are identified through delay lines.

Another use of delay networks is on telephone lines. Some frequencies normally would run ahead of others on telephone lines. But, for conveying messages properly, it is necessary for the frequencies to be synchronized, to arrive at a given place at a given time. A delay line equalizes the frequencies, or delays them different amounts of time so that they arrive at the right place at the right time. The process is something like what would happen if an object were dropped through air and then through a layer of water. It would move faster through the air sector than through water, which would slow it up. Scientists could provide just the right amount of air and water to be sure that a weight would use up a predetermined amount of time if it were dropped. Delay lines do to electric impulses what the water and air would do in this homely illustration, but the factors are infinitely more delicate in electronics as we shall see.

Perhaps one more illustration will serve to picture these unique electronic components. Staggered traffic lighting systems, in a sense, perform for traffic what delay lines do for electric impulses. The staggered lighting system can be arranged to move automobiles along at predetermined speeds and thus assure an even flow, eliminating traffic jams. Delay lines can be designed to restrain the motion of electric impulses, similarly, and allow them to flow as required.

Infinitesimal Time

Electrical impulses travel fast. How fast they travel is indicated by the demands made on a delay line that is fashioned to control them. Delay lines reckon with time so brief that a thousandth of a second is pedestrian. A thousandth of a millionth of a second is a commonplace time element in delay lines. In fact, a word has been invented to designate this— "nanosecond." The delay time involved in all the thousands of delay lines thus far built by this company, if operated end-on-end, would add up to less than one minute.

How Delay Networks Grew

As carriers of intelligence, pulses of electrical energy have been used since the invention of the telegraph because of their simplicity of generation, ease of recognition and relative immunity to noise. These inherent characteristics became still more significant during World War II when the development of radar started a wholly new science of pulse technology. Today electrical impulses are the primary carriers of intelligence in almost every sophisticated electronic system.

Of great importance in such systems is a component that has the ability to achieve a desired time relationship among electrical impulses and signals by delaying one or more of them for specific intervals of time, generally running in the order of milli-microseconds to milli-seconds. Pulse delay networks, the principal product of the company, developed as the new

technology grew. Among their uses are: in the control systems of guided missiles and in telemetering systems between satellites and the earth; in digital computers and electronic data-processing equipment; in communication systems; in radar systems; in television camera chains; and in aircraft identification and landing systems. Because they are passive networks, they perform reliably for long periods in extreme environments.

Why Creativity?

From this record, it can be seen that as electronics develops in all phases of human activity, new and perhaps even unpredictable demands will be made for delay lines or their counterparts. As developments in TV, radar, data processing, missiles, or any of the modern wonders, require new combinations and conditions for controlling electrical impulses, engineers will go to work designing delay lines for the new purposes. Since there currently seems to be no end to the variations and implications in the use of delay lines, there seems to be no end to the combinations of ways in which they will have to be designed to solve problems as they arise. To tackle these problems, awareness of the importance of the creative instinct in a staff of engineers is vital. This company is fully awake to this challenge.

Filters and Transformers

Since 1958, this company has been producing additional electronic components, electro-magnetic filters and wide band video transformers. Our electro-magnetic filters are designed to select useful or desired electrical signals and to reject those that interfere or are undesired. A simple example would be that of a mobile radio unit in a taxicab. For obvious reasons, its reception should be tuned to cab headquarters, not to the police department. The filter keeps the cab radio on beam. Electro-magnetic filters are used in far more complex and diverse situations than that, however. They are useful not only in communications systems, but also in data processing, telemetering, servomechanisms and multiplex telegraphy.

ESC's wide-band transformers have been custom-designed and manufactured to meet the requirements of simultaneous transmission of both low and high frequencies commonly encountered in television, computers, scatter transmission, atomic instrumentations, etc. Conventional transformers will transmit only a relatively narrow band in audio, intermediate frequency range, radio frequency range and very high frequency range. ESC has constructed a substantial number of prototypes which have been delivered to customers, but to date the production orders have been limited in quantity. It remains to be seen whether a profitable market will develop.

Transformers, nonetheless, currently offer some promise. The layman might identify them as devices which operate like the process that occurs when a city's water supply pours from many sources through huge viaducts and then is divided into diverse directions, sizes and pressures, for use in many faucets. The wide-band transformer, indeed, is an unusual conveyor and distributor.

Prototypes

Most businesses do not routinely use the prototype as it is known in electronics. It is a tested, working sample, specially designed for the customer's need. In a limited sense, it is the first try-on suit the customer orders, the one he uses for a fitting before it is finished. There the similarity ends, for the suit-wearer orders only one, or perhaps two—but the delay-line user may order only a few dozen, or hundreds, or thousands.

The prototype is the ESC answer to the customer question: "What can you create that will do and be all these things?" in electronics.

In 1959, the company built 288 prototypes. During 1960, up to October 30, ESC built and delivered 333 prototypes. This is at the rate of about 400 for the year 1960.

WHO'S WHO IN THE COMPUTER FIELD

From time to time we bring up to date our "Who's Who in the Computer Field." We are currently asking all computer people to fill in the following Who's Who Entry Form, and send it to us for their free listing in the Who's Who that we publish from time to time in **Computers and Automation.** We are often asked questions about computer people—and if we have up to date information in our file, we can answer those questions.

If you are interested in the computer field, please fill in and send us the following Who's Who Entry Form (to avoid tearing the magazine, the form may be copied on any piece of paper).

Name? (please print)........................

Your Address? ....

Your Organization? ....

Its Address? ....

Your Title? ....

Your Main Computer Interests?

( ) Applications
( ) Business
( ) Construction
( ) Design
( ) Electronics
( ) Logic
( ) Mathematics
( ) Programming
( ) Sales
( ) Other (specify):

....

Year of birth?.....................................

College or last school?......................

Year entered the computer field?....

Occupation? ....

Anything else? (publications, distinctions, etc.) ....

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When you have filled in this entry form please send it to: Who's Who Editor, **Computers and Automation,** 815 Washington Street, Newtonville 60, Mass.

NEWS of Computers and Data Processors

"ACROSS THE EDITOR'S DESK"

COMPUTERS AND AUTOMATION

Volume 10
Number 2B

FEBRUARY 2,1961

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September 1951

Published by Berkeley Enterprises, Inc., 815 Washington St., Newtonville 60, Mass.

THE COMPUTER DIRECTORY AND BUYERS'GUIDE FOR 1961, 7TH ANNUAL EDITION

The Computer Directory and Buyers'Guide for 1961, the 7th annual edition, will be published this year in July on a new basis.

We shall seek to make it a complete and inclusive directory and guide for the greatly expanding field of computers and data processors.

It will contain at least the following reference information:

1. Roster of Organizations
2. Roster of Products and Services: The Buyers' Guide
3. Roster of Computing Services
4. Roster of Consulting Services
5. Descriptions of General Purpose Digital Computing Systems
6. Descriptions of Analog Computers
7. Descriptions of Special Purpose Computers, and other reference information

If there is any kind of reference information which you would like to see published in the Computer Directory, please send us your suggestions, QUICKLY.

All regular editorial entries in the directory will be published FREE, and the first 25 words of <u>any</u> editorial entry will be FREE. For example, there will be no charge for 22 words of description (subject to editing) of a product in the "Roster of Products and Services".

For subscriptions received March 1 and later, the "Computer Directory" will no longer be automatically included in every subscription to "Computers and Automation". The price of the directory will be $12 before publication, $15 after publication. Any purchaser of the directory will receive the monthly issues of "Computers and Automation" at no additional cost. If the directory is not included in a subscription, the price of the monthly issues of "Computers and Automation" will remain at $7.50 per year (in the United States).

BATTERY OPERATED COMPUTER

Packard Bell Computer
Subsidiary, Packard Bell Electronics
1905 Armacost Ave.
Los Angeles, Calif.

For the first time, we believe, an electronic computer can operate entirely from a battery power supply. The computer, a PB 250 manufactured by this company, was demonstrated at the Eastern Join Computer Conference, New York, in December.

The PB 250 is normally operated from the battery, which is plugged into a standard 115 volt power line and is continously regenerated by trickle charging. If the 115 volt input to the charger is interrupted, however, the computer can continue in operation without any more electricity for more than one hour. The PB 250 battery supply incorporates sealed cells with a life of more than 5 years without service.

The battery supply can be charged from even poorly regulated mobile generators as efficiently as from a power line, while the computer executes thousands of mathematical operations every second.

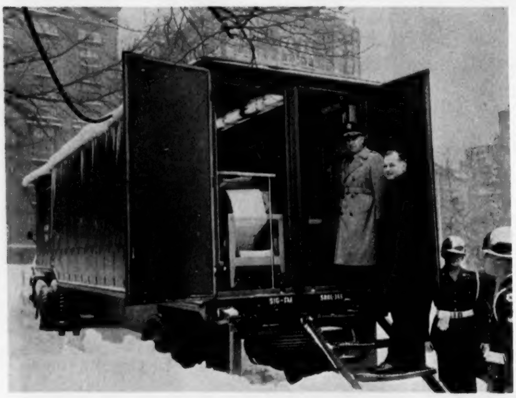
RUGGED, MOBILE, DIGITAL COMPUTER OFF TO U. S. 7TH ARMY IN WEST GERMANY

Sylvania Electronic Systems
Needham 94, Mass.

In January, the mobile general-purpose digital computer MOBIDIC 7A built by this company was turned over to the United States 7th Army, and shipped to Zweibrucken, West Germany. This digital computer is ruggedized for use in the field; it occupies 3 standard 30-foot Army trailer vans.

The vans contain (1) the complete high-speed computer system, (2) an off-line control system which allows independent performance of large-capacity administrative functions simultaneous with operation of the central computer system, and (3) maintenance and support equipment and facilities. The weight of the equipment is 6 to 10 tons. The power required is 30 to 50 KVA. The computer will perform 50,000 typical operations per second (10 typical operations are defined as 7 additions plus 3 multiplications). It is a 38-bit, parallel, binary machine, with fixed point. It uses 52 instructions (standard Fieldata code). The computer can be rapidly interrupted by a call from high priority program, and when that is completed, will at once return to its original program.

At Zweibrucken, the first assignment of MOBIDIC will be to control thousands of supply requisitions for items such as replacement parts for rockets, guided missiles, electronic warfare, air defense, combat surveillance or atomic artillery. It will process more than 18,000 requisitions each day to and from depots which supply some 200,000 different line items to the 7th Field Army, and dispatch supplies from depots to combat units in hours instead of the days once required. The saving in reduction of inventory combined with increased accessibility should pay for MOBIDIC several times over.



MOBIDIC is made rugged for movement and operation under extreme environmental conditions. Emphasis in design was on performance with extreme reliability in combat, and resistance to extremes of shock, vibration, humidity, dust and temperature. In the hard road testing of ruggedization at the Aberdeen Proving Ground, the truck containing the computer developed defects and not the computer.

An evaluation model of MOBIDIC was publicly displayed in New York in December in conjunction with the Eastern Joint Computer Conference. The picture shows a MOBIDIC computer in Central Park, New York, in a snow storm on December 12, 1959.

Additional models of MOBIDIC are under development for various military uses, including test at the U. S. Army Electronic Proving Ground, Fort Huachuca, Ariz., and applications within the future Army Tactical Operations Center and other projects.

NEW RETAIL ACCOUNTING SYSTEM WITH OPTICAL SCANNER

Farrington Manufacturing Co.
Needham Heights 94, Mass.

A new retail accounting system designed around an optical scanner has been developed by this company.

The system includes credit card tokens, imprinters, variable encoders, cash registers, forms, the Farrington Optical Scanner, and conventional business machines or other data processing equipment.

The optical scanner can "read" the customer's account number, amount of sale, salesperson's number, transaction code, register and home department number, salescheck number, and convert the information at high speed into a punched card record.

It also can recognize other information such as cash, miscellaneous charges, sales taxes, etc., and punch machine codes for the respective answer permitting mechanical sorting of punch card saleschecks into "yes" or "no" categories. The Farrington reading machine is the only optical scanner in commercial operation today.

FIRST COMPUTER-DESIGNED COMPUTER OFF TO SOUTH ATLANTIC

Bell Telephone Laboratories
463 West St.
New York 14, N.Y.

The first computer built from complete wiring information and parts lists furnished by another computer has been completed. It was shipped on Jan. 16 to Ascension Island, near the target area of the Atlantic Missile Range. The computer is to be used in connection with target-tracking tests for NIKE-ZEUS, the U. S. Army's anti-missile defense system.

The entire logic network of the digital computer, consisting of 47 sub assemblies, had been built from wiring diagrams, assembly information, and parts lists produced by a specially-programmed, general-purpose digital computer. The computer was built at Burlington, N.C., by the Western Electric Company.

The Bell Laboratories Automatic DEsign System, abbreviated BLADES, required less than 25 minutes per subassembly to produce manufacturing information which would have consumed four man-weeks of manual effort with conventional drafting methods. Use of the BLADE System can save thousands of man-weeks of time in the design of equipment.

In addition, manufacturing information can be converted into a control program for an automatic wiring machine, which would do the actual assembly work. Initial experiments on this aspect of the program are now underway. Results indicate that automatic wiring of the mechanically-designed computer is feasible. This will, of course, result in additional substantial savings in time and money.

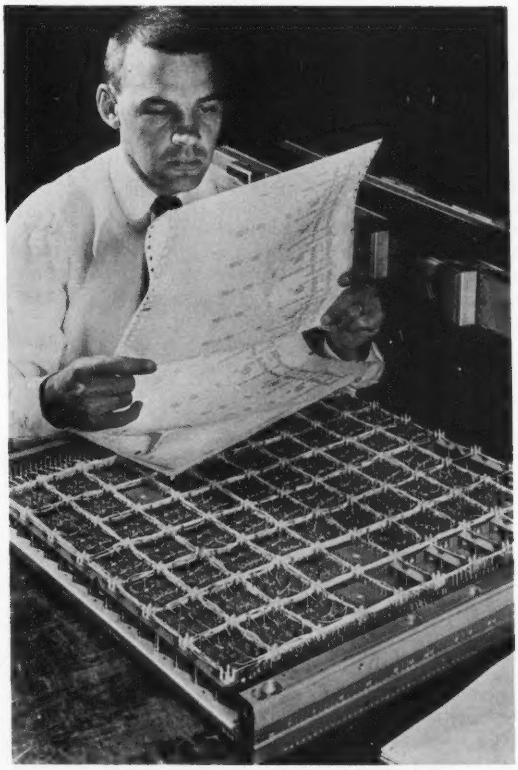
The first step in designing the computer was the synthesis of the logic network to perform the necessary functions. This network was then converted into a set of topologic equations, expressing both the topology and logic of the network, in computer language. (Topology involves the geometric aspects of the network; i.e., the position of each component and its relation to other components.)

The general purpose computer then used these topologic equations to produce sheets of instructions specifying the number of modular logic packages to be used in a subassembly.

The instructions also specified the pins to be interconnected, the size and length of wire to be used in connecting them, and the wire paths to be followed for minimum path length. Any special-purpose logic packages to be used in a subassembly were also specified by the computer.

After the wiring information sheets were completed, a complete parts list including logic packages, externally wired resistors and capacitors, and necessary wire was prepared.

The majority of the logic packages in the Zeus computer are of a single general-purpose type. Any logic function can be performed anywhere on the subassembly by varying the interconnections among the packages. The module package contains four individual and independent logic switches which can be interconnected to form 2-, 3-, or 4- terminal logic gates, or flip-flop circuits.



— A Bell Laboratories' engineer at Whippany, N.J., checks design information for the first computer built from complete information furnished by another computer. A subassembly of the computer is on the table. The computer will be used with the target-track radar for the Army's NIKE-ZEUS anti-missile defense system. --

The computer shipped Jan. 16 uses about 2500 of these logic packages, plus about 200 packages of other types in its 47 subassemblies. The BLADE System, as currently designed, can handle up to 12 different types of packages.

Separate wiring instructions for power and signal wiring are provided. Also, power wiring is arranged so that no two successive logic functions are supplied by the same power bus.

ELECTRONIC TUTOR AND INTERVIEWER GUIDED BY A COMPUTER

System Development Corp.
2500 Colorado Avenue
Santa Monica, Calif.

A computer-operated teaching system with the ability to tailor its instructions to an individual student's talent was demonstrated at the recent Eastern Joint Computer Conference. The heart of this "automated teaching research machine" is a Bendix G-15 electronic computer, programmed to sense a student's needs, respond to his errors, and build his knowledge and confidence quickly and reliably. Teaching machines may be a major resource in the face of an expected shortage of teachers that may amount to 250,000 instructors within five years.

The electronic tutor could be the forerunner of small individual desk units capable of being centrally controlled by a master computer. When properly programmed the system could simulate a human tutor and work with as many as 100 students simultaneously -- but on an individual basis.

The automated teacher took participants through a series of questions on Christopher Columbus. The questions, all multiple-choice, were displayed by a slide projector controlled by the G-15. The "student" answered by pressing a key on an electric typewriter. The computer immediately acknowledged the answer as "right" or "wrong", ordered up another slide, and kept a record of performance on each question.

When the student missed a question, the machine "detoured" him to a special set of remedial questions. Once his performance on the remedial set was satisfactory, he was returned to the main program of the course, to be detoured again only when he was unsure of an answer.

The machine may take the student out of the original series completely and into other basic series if the student requires excessive remedial help. The computer can make a major change in the training approach according to the individual student's needs, just as a human tutor can do.

Thus the machine can be programmed to help both the bright and the slow learner. If the student's performance is high enough he can skip whole items in the basic series. If the student indicates doubt or confusion or takes too much time in answering, the computer may divert the student to less difficult questions.

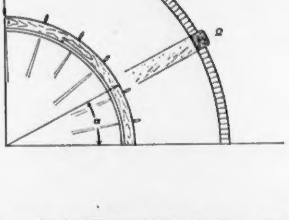
This responsiveness to delay in the student's reaction is particularly designed to help the slow learner.

Though designed originally as a teaching aid, the automated teaching machine could also be the basis of other information gathering and dispensing systems.

Two other possible uses of the "humanized" computer were also demonstrated. In one case the system played the role of student counselor and, acting on previously programmed information about the student's interests, quizzed him to determine basic aptitude for a chosen field (in this case, journalism). At the end of the "interview" the machine suggested a course of studies and activities that seemed to best suit the student.

In the other case, the system impersonated a medical interviewer, questioning a patient on a standard series of facts about his family's medical history. (Sample question: Have you, or any blood relatives, ever been afflicted by varicose veins? The patient can answer "Yes," "No," "I don't know," or "I don't know what varicose veins are." In the last case he gets a photographic slide that shows him what varicose veins are and another asking the question again). The information gained from the interview would be immediately available to doctors for making diagnosis, and for permanent retention as a complete file on the patient.

While such machines have certain human qualities, the instruction-giving or information-collecting abilities it may possess are only as good as the stored programs placed in the machines by a teacher, counselor or doctor.



MARYLAND HIGH SCHOOL STUDENTS LEARN COMPUTER PROGRAMMING AND PRACTICE ON THE IBM 709

Zeke Seligsohn, Public Relations Chairman
Association for Computing Machinery
1111 Connecticut Avenue, NW
Washington 6, D.C.

On the morning of January 7, the console lights flashed on the giant IBM 709 computer at the IBM Space Computing Center. An intense group of young computer programmers gathered around the machine, watching as it calculated second-by-second altitudes of five simultaneous rocket shots.

An ordinary sight at the Computing Center? Not quite -- because the group consisted of 26 juniors and seniors from Bethesda-Chevy Chase High School. The students had reached the climax of a 15-week course in High-Speed Digital Computing, and were testing the programs they themselves had written to solve the rocket problem.

The Saturday morning course, sponsored jointly by the Washington, D.C., Chapter of the Association for Computing Machinery and the Board of Education of Montgomery County, Maryland, is an unusual experiment designed to attract talented youngsters to the computing field -- and especially to the computer programming profession. There is a current nationwide shortage of computer programmers. It is expected that some 200,000 new programmers will be needed by business, industry, government and research in the next ten years.

The ACM course covered such topics as the history of computers, the use of binary and octal number systems, analysis of typical problems, fundamentals of programming, and applications of computers. Several outstanding authorities on war gaming, automatic language translation, satellite tracking, and business applications addressed the class during the term.

The students learned how to program a simple, theoretical computer at first. Then they worked up to writing programs for the high-speed IBM 709 computer, capable of 40,000 calculations per second. Actual IBM manuals for the 709 were used as training aids, as well as motion pictures specifically designed to teach computer programming and computer technology. IBM's Federal Systems Division provided free program check-out time on the multi-million dollar 709 computer at the Space Computing Center. First-hand information about the programming profession was

also obtained from IBM personnel during a student field trip to the company's Systems Center in Bethesda, Maryland.

Students who volunteered for the extracurricular course took on three class hours per week, with an average of 4-5 additional hours homework a week. Requirements for the course included: grades of A or B in all regular classwork; two years of algebra, one year of geometry, and one year of physics (or enrollment in one of the latter two courses); and a high degree of interest in mathematics and science.

The current course is part of a rapidly expanding educational program of the ACM -- the nation's largest computer organization, with over 7,000 members. The Washington, D.C. Chapter plans to present similar courses in several other local high schools next semester.

ASSOCIATION OF DATA PROCESSING SERVICE ORGANIZATIONS FORMED

W. H. Evans, Executive Vice President
Association of Data Processing Organizations
1000 Highland Ave.
Abington, Pa.

Leading American and Canadian companies in the computer and punched-card service field have formed the Association of Data Processing Service Organizations (ADAPSO). Its purpose is to maintain high-performance standards and thus further improve service to business and science, and awareness of public service aspects.

The new association is made up of companies which service clients through data processing centers, as distinct from companies which manufacture and rent or sell equipment. Data processing service centers or bureaus perform various tasks on their own premises, for a fee, based on the type of work done and the time required to complete it. They serve firms which do not have sufficient work to justify investing in their own computers or punched-card machines, or who lack the specialized know-how required for data-processing systems.

Association officers include:

President: Mr. Romuald Slimak, Mgr. of Remington Rand Univac Service Centers

Vice Pres.: Z. V. Zakarian, Mgr., New York Electronic Systems Center, Radio Corporation of America

Treasurer: C. G. Green, President, Statistical Reporting & Tabulating Ltd., Toronto, Canada

Director: G. M. Witherspoon, Mgr., Data Processing Centers, National Cash Register Company, Dayton, Ohio

Director: H. W. Robinson, President, Corporation for Economic & Industrial Research, Arlington, Va.

Director: R. C. May, Vice President, May & Speh, Chicago, Ill.

Director: J. H. McDonald, Vice President, Recording & Statistical Company, New York, N.Y.

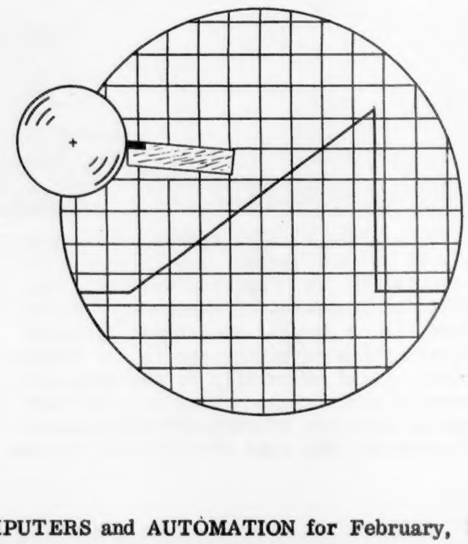
Other members include: W. A. Lynch, The Service Bureau Corporation; A. M. Lount, Enelco Ltd., Toronto; T. Yamashita, Bendix Corp.; Walter Camenisch, Walter Camenisch, Inc.; G. W. L. Davis, Ferranti-Packard Electric Ltd.; William Levy, Nationwide Tabulating Corp.

Other leading organizations in the field, which include a great number of independents, have expressed interest in ADAPSO and are expected to join soon.

The Association is a cross-section of this new and rapidly growing business service. Thus, independents (small and large), chains and manufacturers' centers are equally active. A one-day symposium was scheduled in New York on January 20. A first directory of all American and Canadian centers is in the making.

Membership is limited to those companies which perform on their own premises work which requires the utilization of such equipment as punched-cards, punched and magnetic tapes, optical readers and computers.

Officers of organizations interested in the Symposium, in being listed in the Directory, or in membership, should communicate with W. H. Evans, at the address above.



TUBE CARRIERS MADE OF CERAMIC-GLASS

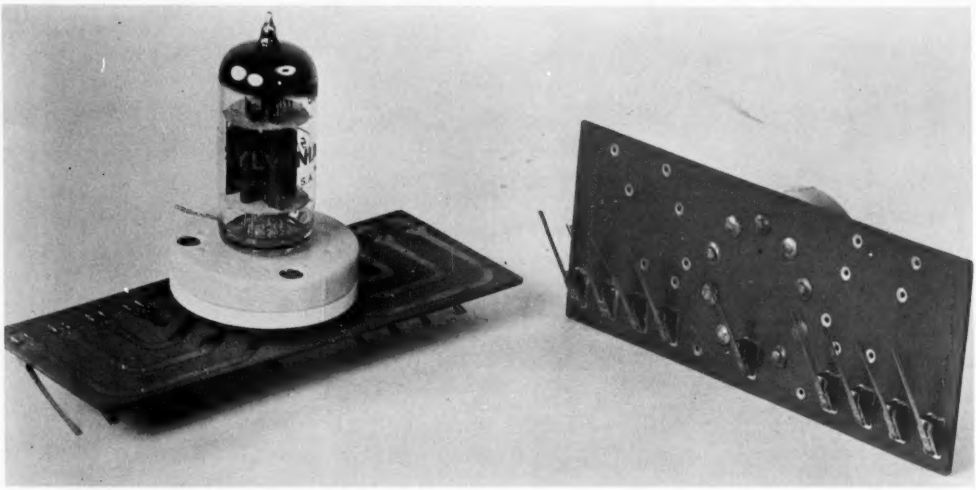
Corning Electronic Components
Division of Corning Glass Works
Bradford, Pa.

Chemically-machined glass ceramic boards transport 154 electron tubes at once through a newly-designed automatic conveyor tester, recently put into operation in the receiving tube headquarters of Sylvania Electric Products, Inc., at Emporium, Pa.

The computer-programmed machine performs up to 23 separate measurements per cycle, depending on the tube type being tested. Different sockets permit testing of hundreds of tube types. The capacity of the machine is 2,500 tubes an hour.

The glass-ceramic boards are produced by a photographic-chemical etching process. The pattern of holes and slots are implanted in photosensitive glass; then the image is etched away. The glass is then converted to a glass-ceramic called Fotoceram.

The unique material was chosen because of its insulation resistance and its adaptability to odd patterns and successive design changes.



-- Glass-ceramic boards made by Corning Electronic Components carry electron tubes through a newly-designed machine that can test 2,500 tubes an hour. Odd patterns of holes and slots required for the boards are achieved with a photographic-chemical etching process. Wire contacts, riding on bus bars, are connected to tubes by metallized circuit paths. Up to 23 separate measurements per cycle can be made on the computer-programmed machine, built by Sylvania Electric Products, Inc.

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64 WEATHER MAPS PER DAY DRAWN ELECTRONICALLY BY PLOTTER

Electronic Associates, Inc.
Long Branch, New Jersey

The U.S. Weather Bureau put into operational use on Dec. 1 an electronic computer-plotter that mechanically draws a complete weather map of the Northern Hemisphere in less than three minutes.

Known as the Weather Plotter, and produced by this company, the electronic unit reads weather information supplied in numerical form on magnetic tape and presents the information to a digital-to-analog converter. The converter then instructs the "mechanical hand" of the plotter to automatically draw contours or isobars, which represent lines of equal barometric pressure, on a 30-by-30 inch map of the Northern Hemisphere. The plotter produces a complete weather map in less than three minutes, compared with approximately 20 minutes required by the former hand-drawn method. Also, the automatic, electronically controlled method produces maps that are much more accurate than those that were hand-drawn.

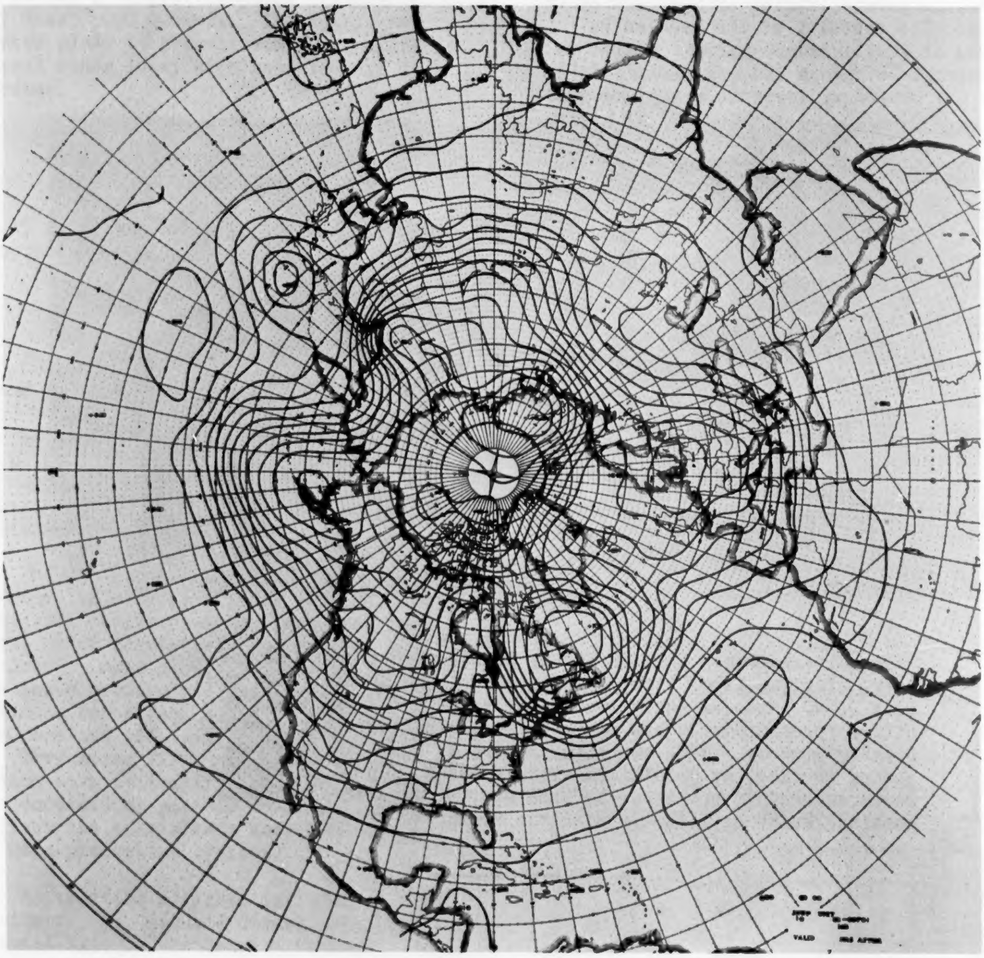


Figure 1
— A 30-by-30-inch weather map produced mechanically by the "Weather Plotter". The isobar map depicts air flow patterns from 18,000 to 20,000 feet.

Information fed into the Weather Plotter is gathered from more than 500 weather observation stations throughout the Northern Hemisphere. Observations are taken twice daily, at noon and midnight London time, and fed into the National Meteorological Center by teletype.

Forecasts, for 12, 24, 48 and 72 hours ahead, are calculated on a programmed computer, and the results recorded on magnetic tape. The tape is then put on the plotter for reading, converting, and map plotting.

During the course of a 24-hour day, 64 weather maps are produced for various altitudes from sea level to 40,000 feet. Each map forecasts air flow patterns for a particular forecast period. Maps of these air flow patterns at 40,000 feet and higher are prepared for use by the military and by airlines in determining the best flying routes and altitudes for jet aircraft.

Immediately after each map is produced, it is distributed by facsimile to 26 U.S. Weather Bureau stations throughout the United States for use in local and regional weather forecasting. Maps also are distributed by facsimile to more than 600 military airfields and stations, airlines, universities and commercial weather forecasting operations.

The reduction in time from 20 to less than three minutes for producing a map permits tightened deadlines with a consequent increase in the usefulness of the information. The equipment is an important step forward in the Weather Bureau's efforts to automate weather data processing, weather analysis and weather forecasting. It is another link in the fundamental technological changes now occurring in the science of meteorology.

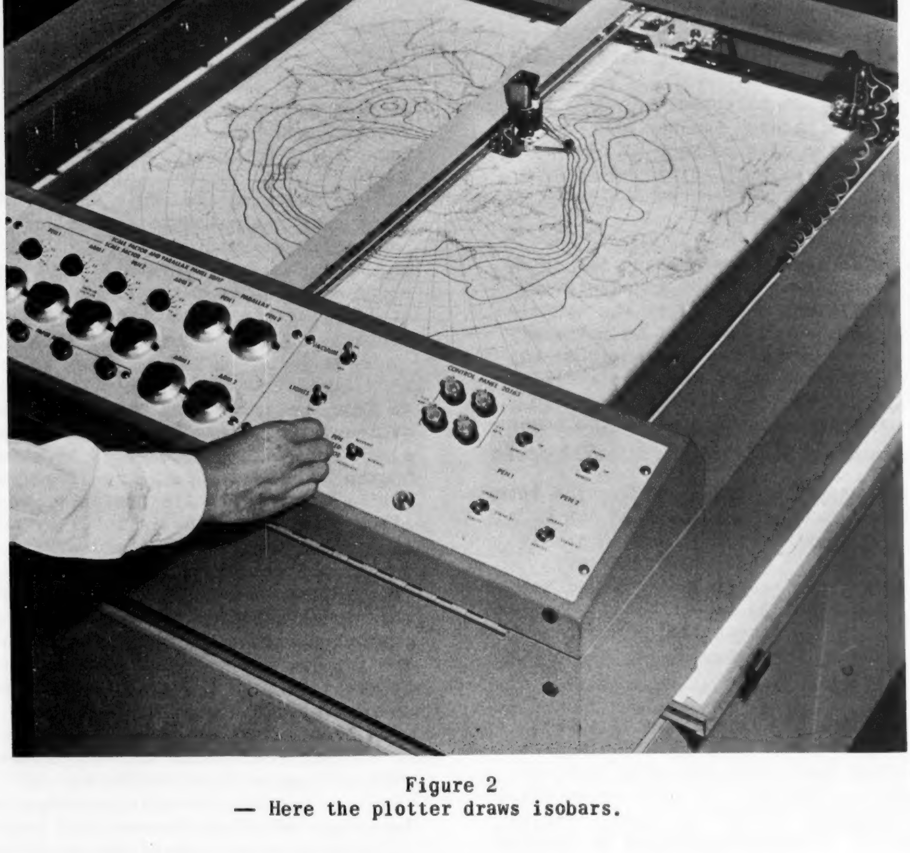


Figure 2
— Here the plotter draws isobars.

INTELLIGIBLE PHONE CONVERSATIONS WITH DIFFERENT LANGUAGES AT EITHER END, DUE IN NEXT 20 YEARS

Dr. Edwin G. Schneider
Vice President, Research and Engineering
Sylvania Electric Products
Needham, Mass.

(Based on a talk before the annual convention of the Telephone Association of New England, Sept. 27, Bretton Woods, N.H.)

An intelligible telephone conversation from continent to continent with different languages being spoken on either end of the line will be possible within the next 20 years.

Automatic translation of transoceanic conversations will be performed through advanced communications and data processing devices.

In regard to the future growth and expansion of communications, we can forecast:

1. A communications satellite network that will make possible global television and high-speed data transmission.
2. "Wireless" telephone calls by pedestrians through two-way pocket radios the size of a package of cigarettes.
3. Transmission of still photographs through the telephone system at a moderate cost.

The basic computer mechanism for automatic translation is already in existence, although primitive; to complete the translation for spoken words, it will be necessary to recognize automatically the basic sounds of speech, independent of the peculiarities of the speaker, and to reconstitute these sounds from information stored in the computer memory.

Rudimentary translation of Russian into English is currently being carried out by a computer. A Russian-English dictionary is coded and stored in the computer memory. The document to be translated is typed out on punched paper tape and fed into the computer, which looks up the corresponding words in the other language. The document is then typed in translated form.

The problem of translation of spoken words does not appear very formidable when one considers that there are only 40 basic sounds used in English. To date, a relatively high degree of success has been achieved in generating recognizable speech by piecing together the appropriate artificially generated speech sounds.

However, the process of automatically recognizing the basic sounds has so far only been solved for very limited cases. For example, fairly reliable recognition of vowels clearly spoken by a male voice has been accomplished -- but the same equipment was unable to understand women. Maybe this was because the men who made the machine didn't understand women either.

There is little doubt that a solution for the speech pattern recognition will be found, and it will have applications beyond that of automatic translation. Applications cited were more efficient use of phone lines -- carrying 100 conversations over a channel which now carries only one, and a speech typewriter, which would reproduce a spoken statement in document form.

NEW DEVICE AIDS HUMAN SUPERVISION OF COMPUTER OPERATION

The Electrada Corporation
Los Angeles 48, Calif.

An electronic unit which provides a new display and control link between the human operator and high speed data processing systems, has been developed.

By matching the logic and speed requirements of the electronic system and the human operator, the unit, called the Electrada Datacom, increases the flexibility of computers and communication systems. In addition, costly interruptions during monitoring and correcting activities are eliminated.

The device accepts digital information at line speed, automatically translates it to ordinary alpha-numeric characters and presents a display on the screen of a cathode-ray tube. As the information is being displayed, the operator may approve its contents, or he may alter them in part or in total by striking a standard typewriter keyboard.

Both incoming and outgoing records are held in the display. When the operator punches the send button, the unit retranslates the information to coded form and transmits it automatically to the associated communications network or computer.

Capable of receiving and sending digital data at speeds of approximately 3600 characters per second, the unit provides automatic interface matching between data processing units or between communications and data

processing systems. It allows the operator to perform selective monitoring, correcting, editing or re-routing of data. The operator may also compose, transmit, receive, correct and expand incoming messages, or send messages composed from prerecorded internally stored forms.

Display of incoming and outgoing data takes place in a high-brightness cathode ray tube, the upper part of which shows the incoming information or message, while the lower part displays the revised or approved version which is to be transmitted. A magnetic storage drum with a capacity of 3072 bits provides a display memory which stores the information for the screen and holds them ready for editing or transmittal. The drum uses transistor read-write circuits, and contains an engraved clock track to prevent accidental clock erasure. Larger-size storage-memory drums can be provided to fit any specific application. The Datacom will also display and correct information stored in the computer's own internal memory when linked directly to the computer memory circuits.

OPTICAL SCANNING INTRODUCED IN TABULATING CARD PUNCH

Remington Rand Univac
A Division of Sperry Rand Corp.
New York, N.Y.

An optical scanning device for data processing systems, called the Optical Scanning Punch, has been developed. It is designed to read handwritten markings on a standard 90-column tabulating card and punch the appropriate code holes into the same card. It works at the speed of 150 cards per minute, it does not require the use of a special magnetic pencil -- any soft lead pencil will do -- and no special symbols are needed. It reads numerals as well as normal pencilled notations such as check marks, lines, X-marks and circles.

By eliminating the need for manual card punching from original source documents, the device drastically reduces the most time-consuming phase of punched-card data processing and automatically detects improperly marked cards.

As many as 40 columns of information can be marked on one side of a standard 90 column card. Suitable cards can be designed to provide 80 columns of marking, using both sides. The marking area for each position on the card (which determines the digital value of the mark) is a relatively large rectangle, so that only a reasonable degree of precision is required of the person marking the card.

The machine is equipped with a sensitivity control mechanism which allows adjustment for cards bearing marks of varying density, thus making it possible to process cards which have been too lightly marked with a pencil and others which may be smudged by dirt or improper erasures.

On reading a card with a missing mark or a double mark, the machine automatically catches the error in one of two ways: it either stops until the error has been corrected, or continues, while automatically segregating the error card into a special reject pocket. Then the reader stops, indicator lamps on the machine's operating control panel automatically signal the type of error and indicate the location of the improperly marked columns.

190,000 STOCK ITEMS HANDLED BY COMPUTER

James E. Burd
Spiegel, Inc.
Chicago 8, Ill.

One of the nation's largest mail order houses, Spiegel, Inc., has installed a powerful new computer system -- the IBM 7070 -- which will ultimately provide daily electronic control over its more than one million customer accounts.

The company has a long range program of automating clerical operations using electronic data processing facilities.

The new system will also eventually provide automatic inventory control for some 190,000 stockkeeping units; therefore the company will probably be the first major mail order house in the country to achieve complete inventory control on a computer.

The system installed is comprised of 22 separate pieces of equipment and incorporates three basic types of data processing -- punched cards, punched paper tape and magnetic tape. Eight magnetic tape drive units each will be able to feed data to the computer at speeds ranging from 15,000 to more than 60,000 alpha-numeric characters per second, while data on paper tape is fed at the rate of 500 characters per second.

Extensive use will be made of the new data processing facilities for other applications, such as sales and marketing research, payroll accounting, credit research and other accounting functions.

TELEMETERING DEVICE SHARES ANALOG FREQUENCY CHANNELS

General Electric Co., Inc.
Schenectady 5, N.Y.

A new digital telemetering system that makes possible transmission of integrated data over existing analog telemeter channels has been produced.

The system is designed to accumulate and register digital data inexpensively, and yet maintain the usual high accuracy inherent to digital techniques. It is believed to be the first system available that can share an existing frequency-type channel. eliminating the need for additional channel facilities.

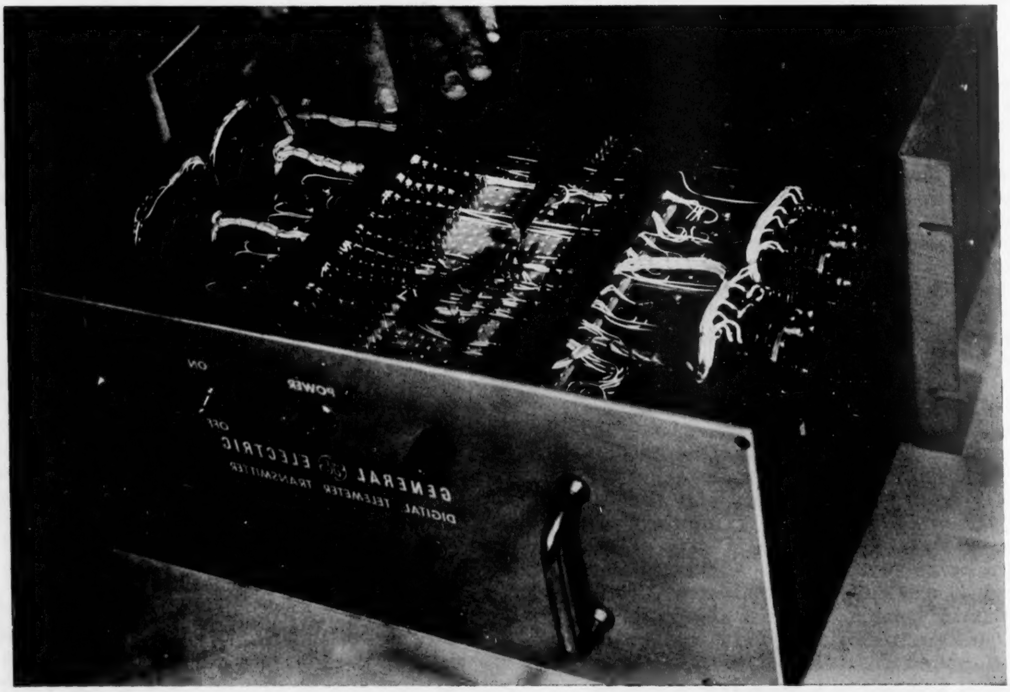
A typical application for the device will be to transmit and record kilowatt-hour data from electric utility tie-lines and substations. In the case of tie-line applications, the engineers said, the equipment will handle both "KWH-in" and "KWH-out" data.

The device is also expected to prove useful in petroleum, natural gas, and hydrostation data collection, where it will permit integrated flow values to be telemetered over existing rate-of-flow channels and recorded digitally at the control point.

Advantage of the equipment is that it 1) eliminates the need for a separate channel, and 2) avoids the inherent one percent error characteristic of integrated analog signals. With the new equipment users will be able to telemeter and record integrated digital data from the sensing source with higher accuracy and at roughly the same cost of adding a separate integrating device.

The system's transmitter accumulates pulse signals and sends totalized data to the receiver at intervals programmed by a built-in timer. Values are relayed in two or three digit form. Since the transmission sequence takes only about four seconds, the interruptions this causes in the analog recording system are negligeable.

Although the digital signal will be "seen" by the rate readout devices, these are indicated as "pips" which can be identified by their regular occurrence. If desired, the rate-recording and associated control devices can be automatically switched out during transmission of the digital signals.



The New Electronics Industry, Education and the Midwest

Dr. Frederick E. Terman
Provost and Vice President
Stanford University
Stanford, Calif.

(Based on a talk at the National Electronics Conference, Chicago, Ill., October 12, 1960)

During the last two decades electronics has become one of the most exciting industries of all times. It is exciting because of its diversity and because of the many challenges it offers. Electronics also attracts interest because of its potential for spectacular financial growth.

A New Electronics

This situation has been brought about by a new electronics that originated about 20 years ago, and which is based on sophisticated applications of recent developments in science and technology. This new electronics lives close to the frontiers of science, and requires a high level of technical competence. It grows by the development of new products. It is characterized by the transistor and other solid-state electronic devices, by electronic computers, by microwave technology in general and microwave tubes in particular, by automation, by the electronics associated with outer space research, etc.

Educational Institutions

In the new electronics, education and also educational institutions, have a new and increasingly important role. To the individual interested in the new electronics, formal university training is essential because the concepts involved in the more advanced and interesting devices are too complex to be acquired by a combination of home study and on-the-job experience. In fact, a minimum of one full year of graduate training is becoming almost a necessity for the bright young man who wishes to participate importantly in the technical aspects of the rapidly moving and most promising areas of electronics. A Ph.D. has become desirable for the man who aspires to be a technical expert.

Concurrently, the university as an institution is acquiring a new significance. Industry is discovering that for those types of electronic activities that involve a high level of creativity of a scientific and technological character, it is more important to be located near an educational institution (i.e., near a center of brains) than near markets, raw materials, components suppliers, transportation, or factory labor. This is because: First, universities are the sources of the highly trained young men who represent the most important raw material going into creative electronics. Second, universities, through their research activities, are sources of ideas; a few of these ideas are directly exploitable commercially, while many others contribute to an understanding that stimulates useful invention and innovation on the part of industry, particularly nearby industry. Third, the faculty members of a good university provide a panel of experts possessing a wide range of highly developed skills available on a consulting basis to aid industry with its problems; thus even a small company near a university can have access to specialized knowledge in depth on a basis that it can afford. Fourth, a university close at hand can provide educational opportunities for employees, whereby bright young men with good potential but inadequate training can be upgraded, and whereby all can be kept abreast of new scientific developments and technological changes. Finally, in an intangible but very real way, a university provides an atmosphere that stimulates creativity and that also makes a community attractive to scientifically minded individuals.

The Factor of Education in the Future of Electronics

When these various factors are viewed in broad perspective, it is seen that education is perhaps the most significant factor affecting the future of electronics. Education is a natural resource of first importance to that part of the electronics industry that is growing through creative activity. Thus, the Boston area may be stagnant in many areas of commerce, but it is one of the liveliest places in the country for the new electronics. The reason for this is easily traceable to the Massachusetts Institute of Technology and Harvard University. Similarly, a spectacular development of creative electronics has taken place on the San Francisco Peninsula during the last dozen years. Stanford University is at the geographical center of this development, and this is not an accident. Stanford University has over 400 day students in its graduate program in electrical engineering, and it trains more Ph.D.'s in electronics than any other school in the country. The faculty at Stanford in the field of electronics also directs a $3.5 million per year research program, the results of which are open to industry.

Electronics in the Midwest

Electronics in the midwest in general, and in Chicago in particular, lacks the explosive character of electronics on the Pacific Coast and in New England. This region is not regarded as leading in the development of new ideas and in the opening up of new fronts of activity. An illustration of this is provided by the article "The Egghead Millionaires" appearing in the September issue of *Fortune*. This paper is about the new breed of young industrial entrepreneurs whose personal roots are founded in technology and applied science, and who have built successful companies based on this fact. Of the 18 proper names men-

tioned in this article—examples of egghead millionaires—only one lives in the midwest between the Alleghenies and the Rockies. Likewise, while MIT, Stanford, and other schools get favorable mention, not a single college in the whole midwestern area is even referred to. Now there are at least some egghead millionaries in the midwest, but the fact remains that the spotlight is clearly not on the midwest when such matters are being talked about. This is because electronics in the midwest has for over a quarter century been more interested in the exploitation and the refinement of existing ideas and existing product lines than in opening up and entering new fields of activity. It has been more concerned with trying to make money by redesigning established products than with attempting to grow from the exploitation of new products barely invented. It has not developed a strong component of research, and as a result has spawned no Bell Telephone Laboratories, David Sarnoff Laboratory, Lincoln Laboratory, General Electric Research Laboratory, etc. In short, the midwest is still preoccupied with the old electronics.

Reasons for Lagging

Now why has the midwest lagged in the new electronics? In searching for the answer one starts with the period before World War II. At that time the midwest was the great center of the nation in electronic manufacturing, with emphasis on such consumer items and components as radio receivers, loud speakers, volume controls, sockets, transformers, etc., in which practical design know-how, materials costs, and efficiency in mass production were critically important in a highly competitive struggle for survival. Early in the decade before the war, the technology of these products had become stabilized to the point where they offered only limited opportunity for creative work growing out of new developments in science and technology. As a result, sophisticated formal college training was not required of the engineers and scientists involved. When the war brought microwave radar, servomechanisms, sonar, the first solid state devices (diodes), computers, etc., the electronics industry of the midwest was unprepared for this turn of events. It did not include very many people who were technically qualified to take a leading part in this type of work, and it did not have in its midst industrial research laboratories capable of pioneering these new developments as did the east with the Bell Telephone Laboratories, General Electric, and RCA. Neither did it have government laboratories such as the Naval Research Laboratory. It also did not develop war research laboratories in electronics associated with universities and staffed with academic types, as typified by the Radiation Laboratory at MIT, the Radio Research Laboratory at Harvard, Underwater Sound Laboratory at Harvard, and the Airborne Instruments Laboratory at Columbia, etc.

As a result of this situation most of the electronics industry of the midwest participated only in a second-hand manner in the new electronics involved in World War II. The leadership in these matters came largely from the east coast, and when the midwest did participate it was largely in the design and production of equipment based on concepts, techniques, and laboratory models originated in the east by groups more deeply oriented in science. Midwest electronics simply did not have the scientific competence by and large to stand on its own feet with respect to these war developed techniques and devices. I have been told by men who were connected with handling war production that the lack of scientific depth of the midwest electronics industry—the lack of a research base—made it very difficult—in fact virtually impossible—to use fully the productive capacity of the midwest in getting these new types of devices produced, whereas on the east coast the production capacity for these desperately needed items was greatly over taxed because it was associated with the scientific know-how necessary to do the job.

At the end of the war electronics in the midwest, having been only superficially innoculated with the new ideas of electronics that originated in World War II, happily reverted to its old interests involving the engineering, design, and production of products and components emphasizing the consumer market, and found in television a sufficient challenge. Although this was highly profitable as long as television was being introduced into new areas, it had limited opportunity for further growth once television was established in every community. In recent years the total dollar sales of television and radio receivers has not been growing much and not much growth can be expected in the years ahead. Moreover, the Japanese may well get an increasing share of the total in the future. During the lush profit days of television, too few of the midwest organizations used their television profits and their existing engineering organizations as a means of establishing a strong position in other areas of electronics that had much greater potential for long range expansion. In this connection, Motorola is an exception, and as a result it has achieved a growth situation not dominated by its consumer goods business.

Electronics on the East Coast

In contrast with the post war course of events in the electronics industry of the midwest, the electronics industry of the east coast continued its interest in the further development of the new concepts introduced into electronics during the war, and maintained and even strengthened research and technical staffs that were strongly based in science. The result has been that the east is now strong in the new areas of electronics such as microwave tubes, electronic computers, transistors and diodes, ferrites, automation, guided missiles, pulse communication, instrumentation, etc. These are the areas that have almost unlimited growth possibilities, in contrast with the consumer goods business.

Electronics on the West Coast

In view of the above, one may wonder why west coast electronics has grown so rapidly during the last 15 years, when it was much less important than the midwest electronics both before and during the war. The answer is that after the war some very strongly science oriented electronics concerns began to develop on the west coast. Hewlett-Packard, Tektronics, Varian Associates, Hughes Aircraft, and Ampex are examples. These companies prospered, and demonstrated the

possibilities of growth and of profits through developing products in which a high proportion of the value was in the engineering involved, in contrast with the principal products of the midwest where the value resided to a much greater degree in material and labor costs. Thus the west, without a tradition, got started in a new and forward looking pattern at the end of the war. An important feature of this development of electronics in the west has been the strong emphasis on graduate training. Many are familiar with the phenomenal concentration of men with M.S. and Ph.D. degrees that Hughes had achieved by the early fifties, and this is a pattern which has been subsequently copied by numerous other west coast companies. This concentration on brains, and along with it an interest in education and in universities has been symbolic of west coast electronics, and probably accounts in large measure for the fact that electronics has grown so rapidly in the west.

Midwest Interest in the Ph.D.

In contrast with the electronics industries on the east and west coasts, the electronics industry of the midwest has not been much interested in the man with the Ph.D. and what he can contribute to the opening up of new frontiers and the resultant development of new products. It has also failed signally to exploit the educational resources and the educational institutions that are available to it. It was not willing during the past fifteen years to put much of its own money into the development of new kinds of products; in fact until recently it hasn't shown much interest in research and development even when the government would pay the bill. To be brutally blunt and frank the major path of electronics took off in a new direction in the decade 1940-50, but too little of the electronics industry of the midwest followed the turn. There are, of course, individual exceptions to these general statements, but in broad terms what is said here is true. Electronics in the midwest somehow just has not developed much enthusiasm for staffing up with high concentrations of people who have the highly technical background required to do creative work in the new and rapidly growing areas of electronics. This is emphasized by the fact that there are various companies with headquarters in Chicago that do their creative work elsewhere in the country, while examples of the reverse are scarce indeed. This situation is further emphasized by the distribution of Fellows of the IRE. These men have received this award in recognition of creative technical or administrative leadership. The Chicago Section currently includes about 15 fellows, while the San Francisco Section has 32, and the Los Angeles Section has 47.

Anti-Intellectualism

The basic problem of midwest electronics is what academic people call anti-intellectualism. Speaking in broad terms, the midwest is more interested in the man with a lot of practical know-how than in the man whose strength is depth of training in advanced science and technology. Not enough of the midwest companies and their leaders know how to make effective use of the "egghead" type. As a result the midwest companies don't really fight for the men with master's and doctor's degrees in electronics being produced by their own universities, let alone by universities in other parts of the country. The consequence is that the midwest schools don't produce such men in large numbers. For example, Stanford alone, and Stanford is not a large school, produces more men each year with advanced degrees in electronics than do all of the institutions in the entire state of Illinois together. Put another way, the state of California produces more men with advanced degrees in electronics each year than do the states of Illinois, Wisconsin, Indiana, Michigan, Minnesota, Missouri and Iowa all put together. Under these circumstances is it any wonder that many of the brightest boys graduating from midwest schools with bachelor degrees are recruited by west coast colleges, and after completion of advanced training there devote their subsequent professional careers to advancing electronics in the west. The same is true of such institutions as MIT and Harvard, who likewise transplant a group of the brightest young people from the midwest to the east coast for advanced training, after which they either settle down somewhere on the Atlantic seaboard or move to California in order to do the type of work they have come to like and for which they see an attractive future.

Another facet of this same anti-intellectualism referred to above is that the electronics industry in the midwest has not adequatetly appreciated the importance of the educational institutions that are in its midst, and has not made full use of them. It is surprising that there are not more electronic companies of the creative type clustered around such schools as the University of Illinois, Purdue, University of Michigan, Michigan State University, Wisconsin, Northwestern, etc. This is the result both of lack of vision on the part of industry and of lack of leadership on the part of the educational institutions. On this particular point, the principal blame may well be placed on the doorsteps of the universities involved; they have had it in their power to take much more initiative than they have taken, and it was in their self interest to do so.

Provocative Intent

These remarks have deliberately attempted to be provocative. The electronics industry of the midwest is in a rut and needs to be jolted out of it. It currently lacks the glamour and the growth potential that it should have. Electronics in the midwest has a long tradition and a successful past. It can have a worthwhile future, and can participate more in the good new things that are ahead in the field of electronics during the next several decades, but only by developing with the times. If it just plods along, the midwest will become increasingly the peon group in the electronics industry, which does hard, unexciting work and makes a living, while at the same time the east coast and particularly the west coast electronics industries will have all of the fun and most of the growth. If the midwest continues in the present pattern, it will continue to be the happy hunting ground where bright young people are recruited to go to the east and west coasts to make the electronics industries there steadily stronger and ever growing.

CALENDAR OF COMING EVENTS

Feb. 1-3, 1961: Winter Convention on Military Electronics, featuring Communications, Telemetry, Data Handling and Display, Los Angeles, Calif.; contact Dr. John J. Meyers, Hoffman Electronics Corp., Military Products Div., 3717 S. Grand Ave., Los Angeles 7, Calif.

Feb. 13-16, 1961: Third Institute on Information Storage and Retrieval, The American University, Washington, D. C.; contact Prof. Lowell H. Hattery, Dir., Center for Technology and Administration, The American University, 1901 F St., N.W., Washington 6, D. C.

Feb. 15-17, 1961: International Solid State Circuits Conference, Univ. of Pa. and Sheraton Hotel, Philadelphia, Pa.; contact Jerome J. Suran, Bldg. 3, Rm. 115, General Electric Co., Syracuse, N. Y.

Mar. 16-17, 1961: Conference on Data Processing Techniques and Systems, sponsored by Numerical Analysis Laboratory at the University of Ariz., featuring "Discussions of data processing problems in engineering and scientific research," Tucson, Ariz.; contact Miss Betty Takvam, Conference Secretary, Numerical Analysis Lab., Univ. of Ariz., Tucson, Ariz.

Mar. 20-23, 1961: IRE International Convention, Coliseum and Waldorf-Astoria Hotel, New York, N. Y.; contact Dr. G. K. Neal, IRE, 1 E. 79 St., New York 21, N. Y.

April, 1961: Joint Automatic Techniques Conference, Cincinnati, Ohio; contact J. E. Eiselein, RCA Victor Div., Bldg. 10-7, Camden 2, N. J.

Apr. 19-21, 1961: S. W. IRE Reg. Conf. and Elec. Show, Dallas, Tex.; contact R. W. Olson, Texas Instruments Co., 6000 Lemmon Ave., Dallas 9, Tex.

May 2-4, 1961: Electronic Components Conference, Jack Tar Hotel, San Francisco, Calif.

May 7-8, 1961: 5th Midwest Symposium on Circuit Theory, Univ. of Ill., Urbana, Ill.; contact Prof. M. E. Van Valkenburg, Dept. EE, Univ. of Illinois, Urbana, Ill.

May 8-10, 1961: 13th Annual National Aerospace Electronics Conference, Biltmore and Miami Hotels, Dayton, Ohio; contact Ronald G. Stimmel, Chairman, Papers Committee, Institute of Radio Engineers, 1 East 79 St., New York 21, N. Y.

May 9-11, 1961: Western Joint Computer Conference, Ambassador Hotel, Los Angeles, Calif.; contact Dr. W. F. Bauer, Ramo-Wooldridge Co., 8433 Fallbrook Ave., Canoga Park, Calif.

May 22-24, 1961: 10th National Telemetering Conference, Sheraton-Towers Hotel, Chicago, Ill.

May 22-24, 1961: Fifth National Symposium on Global Communications (GLOBECOM V), Hotel Sherman, Chicago, Ill.; contact Donald C. Campbell, Tech. Program Comm., I.T.T. — Kellogg, 5959 S. Harlem Ave., Chicago 38, Ill.

May 23-25, 1961: Symposium on Large Capacity Memory Techniques for Computing Systems, Dept. of Interior Auditorium, C St., Washington, D. C.; contact Miss Josephine Leno, Code 430A, Office of Naval Research, Washington 25, D. C.

June 6-8, 1961: ISA Summer Instrument-Automation Conference & Exhibit, Royal York Hotel and Queen Elizabeth Hall, Toronto, Ontario, Can.; contact William H. Kushnick, Exec. Dir., ISA, 313 6th Ave., Pittsburgh 22, Pa.

June 28-30, 1961: Joint Automatic Control Conference, Univ. of Colorado, Boulder, Colo.; contact Dr. Robert Kramer, Elec. Sys. Lab., M.I.T., Cambridge 39, Mass.

June 28-30, 1961: 1961 National Conference and Exhibit, National Machine Accountants Association, Royal York Hotel, Toronto, Canada; contact R. C. Elliott, NMAA, 1750 W. Central Rd., Mt. Prospect, Ill.

July 9-14, 1961: 4th International Conference on Bio-Medical Electronics & 14th Conference on Elec. Tech. in Med. & Bio., Waldorf Hotel, New York, N. Y.; contact Herman Schwan, Univ. of Pa., School of EE, Philadelphia, Pa.

July 16-21, 1961: 4th International Conf. on Medical Electronics & 14th Conf. on Elec. Tech. in Med. & Bio., Waldorf Astoria Hotel, New York, N. Y.; contact Dr. Herman P. Schwan, Univ. of Pa., Moore School of Electrical Eng., Philadelphia 4, Pa.

Aug. 22-25, 1961: WESCON, San Francisco, Calif.; contact Business Mgr., WESCON, 1435 La Cienega Blvd., Los Angeles, Calif.

Sept., 1961: Symposium on Information Theory, M.I.T., Cambridge, Mass.

Sept. 4-9, 1961: Third International Conference on Analog Computation, organized by the International Association for Analog Computation and the Yugoslav National Committee for Electronics, Telecommunications, Automation and Nuclear Engineering, Belgrade, Yugoslavia.

Sept. 6-8, 1961: National Symposium on Space Elec. & Telemetry, Albuquerque, N. M.; contact Dr. B. L. Basore, 2405 Parsifal, N.E., Albuquerque, N. M.

Sept. 6-8, 1961: International Symposium on the Transmission and Processing of Information, Mass. Inst. of Technology, Cambridge, Mass.; contact Peter Elias, RLE, M.I.T., Cambridge 39, Mass.

Sept. 6-8, 1961: 1961 Annual Meeting of the Association for Computing Machinery, Statler Hotel, Los Angeles, Calif.; contact Benjamin Handy, Chairman, Local Arrangements Committee, Litton Industries, Inc., 11728 W. Olympic Blvd., W. Los Angeles, Calif.

Sept. 11-15, 1961: The Third International Congress on Cybernetics, Namur, Belgium; contact Secretariat of The International Association for Cybernetics, 13, rue Basse Marcelle, Namur, Belgium.

Sept. 11-15, 1961: ISA Fall Instrument-Automation Conference & Exhibit and ISA's 16th Annual Meeting, The Biltmore Hotel and Memorial Sports Arena, Los Angeles, Calif.; contact William H. Kushnick, Exec. Dir., ISA, 313 6th Ave., Pittsburgh 22, Pa.

Oct., 1961: National Symposium on Space Elec. & Telemetry, Albuquerque, N. M.; contact A. B. Church, 1504 Princeton, S.E., Albuquerque, N. M.

Dec. 12-14, 1961: Eastern Joint Computer Conference, Sheraton Park Hotel, Washington, D. C.; contact Jack Moshman, C-E-I-R, Inc., 1200 Jefferson Davis Highway, Arlington 2, Va.

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- Survey of Special Purpose Digital Computers (Sept. 1958)
- Survey of Commercial Computers (Jan., Feb. 1960)
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- Types of Automatic Computing Machinery (Nov. 1958)

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Closed-Loop Computer Control at Luling / R. D. Eisenhardt and T. J. Williams, Monsanto Chemical Co. / Control Engineering, vol. 7, no. 11, Nov., 1960, p 103 / McGraw-Hill Pub. Co., Inc., 330 West 42 St., New York 36, N. Y.

A chemical company uses a digital computer to control chemical processes, in particular, the process of refining ammonia. This article presents a thorough discussion by several authors of the system, describing how the mathematical model was established, how the ammonia is made, and how complete closed-loop control is effected. Economic aspects are discussed.

Digital Data Processing System for Telemeter-to-Computer Linkages / Edward H. Claggett, Project Engineer, Radiation, Inc., Melbourne, Fla. / Automatic Control, vol. 13, no. 5, Nov., 1960, p 39 / Reinhold Pub. Corp., 430 Park Ave., New York 22, N. Y.

The Digital Data Processor, a system which serves as the necessary link between telemetry devices and digital computers, is described. The DIDAP system's many features include tape and format translation, operation in various modes, and flexibility in the areas of input-output operation. These features and the modes are described.

Automatic Mechanical Self-Reproduction / L. S. Penrose / New Biology, no. 28, Jan., 1959, pp 92-117 / Penguin Books Inc., 3300 Clipper Mill Rd., Baltimore 11, Md.

This paper discusses the possibilities of self-reproduction in various mechanical systems which range from simple, i.e., zip fasteners, to complex, i.e., massive units composed of a great number of components. The machines described fall into two categories: those which can reproduce without self-destruction, and those which cannot. In most cases, the reproduction processes involved suggest cellular processes. The author concludes with a philosophic discussion on the question of whether these mechanisms can be considered "alive."

A Computer as an Experimental Laboratory Machine for Research on Automated Teaching Procedures / Harry F. Silberman / Behavioral Science, vol. 5, no. 2, April, 1960, p 175 / Mental Health Research Institute, Univ. of Michigan, Ann Arbor, Mich.

A plan for using a computer as a tool for teaching procedures is described. The computer is applied to the task of studying various teaching methods. The article discusses benefits to be derived from "teaching machines"—machines which present a problem and require student response.

Intelligence in Computers: The Psychology of Perception in People and in Machines / Leonard Uhr / Behavioral Science, vol. 5, no. 2, April, 1960, p 177 / Mental Health Research Institute, Univ. of Michigan, Ann Arbor, Mich.

After an introductory statement which tends to relegate the computer to idiot status, the author proceeds to explain how the computer, when directed properly, can be used in highly intelligent ways. In particular, machines that "perceive" are discussed.

Theory Construction or Fact-Finding in a Computer Age? / Charles F. Wrigley / Behavioral Science, vol. 5, no. 2, April, 1960, p 183 / Mental Health Research Institute, Univ. of Michigan, Ann Arbor, Mich.

Often, articles and discussions about computer centers concentrate on the personnel and hardware problems. This article concentrates instead on the question: what effect will computers have on established views? The field in question is psychology and the author discusses the influences of computers, and mentions some applications in the field.

Multiprogramming STRETCH: Feasibility Consideration / E. F. Codd, E. S. Lowry, E. McDonough, C. A. Scalzi, IBM Corp. / Communications of the ACM, Nov., 1959, p 13 / ACM, Mt. Royal and Guilford Aves., Baltimore 2, Md.

This article discusses some of the conditions which must be established for a successful multiprogram system, mentioning the problems which make the conditions necessary. The authors then explain how the STRETCH meets the conditions prescribed.

The Present Theory of Turing Computability / Hartley Rogers, Jr. / Journal of the Soc. for Indus. and Applied Math., vol. 7, no. 1, March, 1959, pp 114-130 / SIAM Publications, Box 7541, Philadelphia 1, Pa.

The first part of this paper discusses in detail the basic concepts and formats of Turing, i.e., "general effective" computability, developed between 1933-43. By "general" is meant that theory which results from removing all limitations of either time or memory upon the action of the computer. The discussion includes a number of theorems and their corollaries which apply to the work of Turing, some of which are proven, others being left as exercises for the reader. In the second part of the paper, the author suggests some further developments and applications that have appeared at an increased rate, up to the present time. A number of references are listed, for computer people interested in further study of the theory.

On Computer Transcription of Manual Morse / C. R. Blair, Dept. of Defense, Wash., D.C. / Journal of the Assn. for Computing Machinery, vol. 6, no. 3, July, 1959, pp 429-42 / Assn. for Computing Machinery, 2 East 63 St., New York 21, N. Y.

Research into past attempts to automatically transcribe hand-sent Morse code into printed copy, led to the decision to attempt simulation of manual Morse transcription devices, on a general-purpose digital computer. Problems of logic were solved independently of those of engineering. The results of the research are discussed in this article, and experiments with the computer are described.

The Organization of a University Computing Centre / R. A. Buckingham / The Computer Journal, vol. 3, no. 3, Oct., 1960, p 131 / The British Computer Society Ltd., Finsbury Ct., Finsbury Pavement, London, E. C. 2.

An increasing number of British universities are establishing data processing centers on their respective campuses. This article discusses the aims of such centers, and describes some of the work accomplished by the centers at the University of London.

Notes on the State of Digital Computing in the U. S. S. R. / Laurence Clarke / The Computer Journal, vol. 3, no. 3, Oct., 1960, p 164 / The British Computer Society Ltd., Finsbury Ct., Finsbury Pavement, London, E. C. 2.

This report on Soviet computer technology is based on a 14-day visit to Moscow, 1960. It discusses current developments and progress in the design and use of data processing equipment in Russia. The URAL and BESM computers are described. Conclusions reached regarding the state of Russian technology include: technology, several years behind but may be expected to advance rapidly; logical thought and application, comparable with Britain.

Computational Aids for Determining the Minimal Form of a Truth Function / Ronald Prather / Journal of the Assn. for Computing Machinery, vol. 7, no. 4, Oct., 1960, pp 299-310 / Assn. for Computing Machinery, Mt. Royal and Guilford Aves., Baltimore 2, Md.

The first part of this article presents information about minimizing the number of terms in a logical truth function, appropriate computer circuitry necessary to realize the functions, and an algorithm which uses decimal numbers obtained from a binary-decimal conversion of the terms of the Boolean function. Then, several computational aids are given which allow for the adaptation of the algorithm to the solution of problems on a computer.

The Manager and the Black Box / Melvin Anshen / Harvard Business Review, vol. 38, no. 6, Nov.-Dec., 1960, p 85 / Graduate School of Business Administration, Harvard Univ., Soldiers Field, Boston 63, Mass.

This article depicts from the manager's point of view the extent of management's reliance on the computer, and its mathematical models, which, characteristically, are considered the black boxes of industry. The various decisions that are to be made, and the various ways of making

them, are discussed. Five conclusions are included which indicate how to adapt to and make use of the new computer technology.

Jonker's Approach to Information Retrieval / Management & Business Automation, vol. 4, no. 5, Nov., 1960, p 18 / The Office Appliance Co., 600 West Jackson Blvd., Chicago 6, Ill.

An interview with the inventor of the "Termatrex," a simple inexpensive system for information retrieval, discloses the type of work that the system can do, and some information about data retrieval in the future. A thoroughly detailed description of the system is presented.

Human-Factors Engineering / H. J. Williams, Supervisor, Human Factors Engineering, Melpar, Inc. / Industrial Research, vol. 2, no. 5, Oct.-Nov., 1960, p 36 / Scientific Research Pub. Co., 200 South Michigan Ave., Chicago 4, Ill.

Some experiments conducted to determine the behaviour of human beings under extreme conditions, are described. Human beings are used as "guinea pigs," while a computer is used to process the results and findings. Moreover, certain conclusions regarding the relationship between man and machine are discussed.

COBOL / John H. DeJong / Data Processing, vol. 2, no. 9, Oct., 1960, p 9 / Gille Associates Inc., 22nd Floor Book Tower, Detroit 26, Mich.

The Common Business Oriented Language, a compiler which is being designed to serve as a common language for computers, is described in detail. The language, and the efficacy with which it is adaptable to all systems, is discussed. The current status of its development is explained, and the general workings of the compiler are described.

NEW PATENTS

RAYMOND R. SKOLNICK
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The following is a compilation of patents pertaining to computers and associated equipment from the "Official Gazette of the United States Patent Office," dates of issue as indicated. Each entry consists of patent number / inventor (s) / assignee / invention. Printed copies of patents may be obtained from the U.S. Commissioner of Patents, Washington 25, D.C., at a cost of 25 cents each.

June 28, 1960 (Cont'd)

2,943,301 / David Loev, Plymouth Meeting, William Miehle, Havertown, and Joseph Wylen, Broomall, Pa. / Burroughs Corp., Detroit, Mich. / A magnetic shift register.

2,943,311 / George D. Hulst, Upper Montclair, N. J. / International Telephone and Telegraph Corp., Nutley, N. J. / An analog-to-digital translator.

2,943,312 / Ferdinand G. von Kummer, Bloomfield, and Frank M. Gallagher, Bristol, Conn. / Royal McBee Corp., Port Chester, N. Y. / A data translating unit.

July 5, 1960

2,943,791 / Robert A. Henle, Hyde Park, and Marion L. Wood, Highland, N. Y. / I. B. M. Corp., New York, N. Y. / A binary adder using transformer logical circuits.

July 12, 1960

2,944,733 / Kenneth L. Austin, Grapevine, Tex. / Burroughs Corp., Detroit, Mich. / A data conversion system.

2,944,738 / Melvin E. Maron, Santa Clara County, and John W. Haanstra, San Jose, Calif. / I. B. M. Corp., New York, N. Y. / A logical data computing device.

2,945,214 / Tom Kilburn and George R. Hoffman, Manchester, Eng. / I. B. M. Corp., New York, N. Y. / A magnetic storage system.

2,945,217 / Robert D. Fisher, Jerome S. Sallo, and Ignatius Tsu, Dayton, Ohio / The National Cash Register Co., Dayton, Ohio / A magnetic data storage device.

2,945,220 / Arnold Lesti, Arlington, Va., and Andrew R. Baechtel, Wheaton, Md. / U. S. A. as represented by the Sec. of Commerce / An analogue to digital converter.

July 19, 1960

2,945,538 / Howard M. Little and Johannes K. Notthoff, Los Angeles, Calif. / Unicorn Eng. Corp., Los Angeles, Calif. / A coding apparatus for information storage tapes and the like.

2,945,625 / Esmond P. Wright, Donald A. Weir, and Joseph Rice, London, Eng.

/ International Standard Electric Corp., New York, N. Y. / Information handling equipment.

2,945,626 / Arthur W. Vance, Union Valley, and Edwin A. Goldberg, Princeton Junction, N. J. / U. S. A. as represented by the Sec. of the Navy / A quarter-Square solver.

2,946,043 / Willard A. Reenstra, Rutherford, and Wesson J. Ritchie, Morris Plains, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / An a.c. coding system for multiple load selection.

2,946,044 / Ralph Bolgiano, Jr., Ithaca, Daniel T. Hurley, Syracuse, and William R. Krafft, Whitesboro, N. Y. / General Electric Co., a corp. of N. Y. / A signal processing system.

2,946,045 / Eiichi Goto, 1416, 4-Chome, Nakameguro, Meguro-ku, Tokyo-to, Japan / .... / A digital memory system.

2,946,046 / Ephraim W. Hogue, Bethesda, Md. / U. S. A. as represented by the Sec. of Commerce / A magnetic digital computer circuit.

2,946,047 / Walter L. Morgan II, Maple Shade, N. J. / U. S. A. as represented by the Sec. of the Navy / A magnetic memory and switching circuit.

July 26, 1960

2,946,984 / Rolland N. Breed, West Caldwell, N. J., Willard B. Groth, Tuckahoe, N. Y., Gordon C. Irwin, Fair Haven, and Lindley A. Kille, Morristown, N. J., and George Riggs, Port Washington, N. Y. / Bell Telephone Lab., Inc., New York, N. Y. / A tape-to-card converter system.

2,946,985 / Wilmur M. McMillan, Wappingers Falls, and Richard W. Lowrie, Poughkeepsie, N. Y., and Edward J. Raser, Concord, Mass. / I. B. M. Corp., New York, N. Y. / A magnetic core buffer storage.

2,946,986 / Donald A. Harrison, Poughkeepsie, N. Y. / I. B. M. Corp., New York, N. Y. / A digital data communications system.

2,946,987 / Stephen E. Townsend, Rochester, N. Y. / General Dynamics Corp., Rochester, N. Y. / A reversible magnetic shift register.

2,946,988 / William Miehle, Havertown, Pa. / Burroughs Corp., Detroit, Mich. / A non-destructive magnetic storage device.

August 2, 1960

2,947,479 / Ernst S. Selmer, Oslo, Norway / Burroughs Corp., Detroit, Mich. / An electronic adder.

2,947,911 / Albert E. Linder, Plainview, N. Y. / American Bosch Arma Corp., a corp. of N. Y. / A readout device.

2,947,929 / John L. Bower, Downey, Calif. / North American Aviation, Inc. / A digital analog servo circuit.

2,947,971 / Marvin H. Glauberman, Medfield, and Robert C. Kelner, Concord, Mass. / Lab. for Electronics, Inc., Boston, Mass. / A data processing system.

2,947,976 / Myron J. Mendelson, Los Angeles, and Alfred Doig, Jr., Culver City, Calif., and Richard E. Sprague, New Canaan, Conn. / The National Cash Register Co., Dayton, Ohio / A computer data merging system.

2,947,977 / Erich Block, Poughkeepsie, N. Y. / I. B. M. Corp., New York, N. Y. / A switch core matrix for a magnetic memory system.

2,947,978 / Michael C. Poylo, New York, N. Y., and Robert L. Whittle, Cedar Grove, N. J. / International Telephone and Telegraph Corp., Nutley, N. J. / A data processing system.

2,947,982 / William H. Newell, Mount Vernon, N. Y. / Sperry Rand Corp., Ford Instrument Company Division, Long Island City, N. Y. / A servo drive system with dynamic error elimination.

August 9, 1960

2,948,882 / Charles R. Fisher, Jr., Rochester, N. Y. / General Dynamics Corp., Rochester, N. Y. / A magnetic data handling system.

2,948,883 / Joseph D. Lawrence, Jr., Philadelphia, Pa. / Sperry Rand Corp., a corp. of Delaware / A magnetic selecting device.

2,948,885 / Raymond Stuart-Williams, Pacific Palisades, Calif. / Telemeter Magnetics, Inc., Los Angeles, Calif. / A data storage memory apparatus.

2,948,886 / Knox McIlwain, Huntington, N. Y. / Hazeltine Research, Inc., Chicago, Ill. / A code setting device for an electrical identification system.

August 16, 1960

2,949,226 / Samuel Lubkin, Bayside, N. Y. / Curtis-Wright Corp., Carlstadt, N. J. / An information transfer device.

2,949,230 / John P. Eckert, Jr., Philadelphia, Pa. / Sperry Rand Corp., New York, N. Y. / A parallel binary adder unit.

2,949,231 / Ernest J. Schubert, Berwyn, Pa. / Westinghouse Electric Corp., East Pittsburgh, Pa. / An arithmetic unit for floating radix notation.

2,949,549 / Henry M. Hoge, Baltimore, Md. / Westinghouse Electric Corp., East Pittsburgh, Pa. / A true current flip-flop element.

August 23, 1960

2,950,052 / Lewis A. Knox, Owego, N. Y. / I. B. M. Corp., New York, N. Y. / An analogue-to-digital precision integrator.

2,950,053 / Charles J. Hirsch, Locust Valley, N. Y. / Hazeltine Research, Inc., Chicago, Ill. / An electrical integrator.

2,950,465 / Philip E. Fox, John E. Bartelt, and David J. Crawford, Poughkeepsie, and Nathaniel Rochester, Wappingers Falls, N. Y. / I. B. M. Corp., New York, N. Y. / An electronic data processing machine.

2,950,467 / Harry Hoffman, Jr., Saugerties, N. Y. / I. B. M. Corp., New York, N. Y. / A multiple section memory.

2,950,468 / James J. Klinikowski, Maple Shade, N. J. / U. S. A. as represented by the Sec. of the Navy / A data shifting circuit.

2,950,469 / Floyd D. Raasch, St. Louis Park, Minn. / Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. / An analogue-to-digital conversion apparatus.

2,950,472 / Lothair H. Rowley, Syosset, N. Y. / Sperry Rand Corp., Ford Instrument Company Division, New York, N. Y. / A digital-to-analog converter.

August 30, 1960

2,951,230 / William J. Cadden, Madison, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A shift register counter.

2,951,231 / Robert de Gaillard, Paris, Fr. / Societe Ananyme Asservelec, Paris, France / Methods of and device for magnetically storing information.

2,951,232 / Lowell D. Amdahl, Redondo Beach, Calif., Byron L. Havens, Closter, N. J., Joachim Jeenel, New York, N. Y., Kenneth E. Schreiner, Harrington Park, N. J., John P. Cedarholm, New York, N. Y., and Norman F. Eichenberger, Cincinnati, Ohio / I. B. M. Corp., New York, N. Y. / A tape control circuit.

2,951,233 / Felipe R. Tanco, Collingswood, N. J., and Luis A. Rivas, Levittown, N. J. / R. C. A., a corp. of Del. / An information storage system.

2,951,234 / Arnold M. Spielberg, Haddonfield, N. J., and Donald W. Evans, Grand Rapids, Mich. / R. C. A., a corp. of Del. / A storage interrogation system.

2,951,239 / Arthur J. Spencer, Sutton Coldfield, England / The British Tabulating Machine Co., Lim., London, Eng. / A magnetic core storage device.

2,951,240 / Andrew H. Bobeck, Chatham, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A magnetic core circuit.

2,951,241 / Edward A. Quade, San Jose, Calif. / I. B. M. Corp., New York, N. Y. / A magnetic storage device.

2,951,242 / Charles R. Fisher, Jr., and Ben A. Harris, Rochester, and Darwell H. Webster, Palmyra, N. Y. / General Dynamics Corp., Rochester, N. Y. / A serial-to-parallel binary code converter device.

September 6, 1960

2,951,986 / Bernard M. Gordon, Newton, Mass. / Epsco, Inc., Boston, Mass. / A signal counting apparatus.

2,952,007 / Albert J. Meyerhoff, Wynnewood, and John O. Paivinen, Berwyn, Pa. / Burroughs Corp., Detroit, Mich. / A magnetic transfer circuit.

2,952,009 / Jean F. Marchand, Eindhoven, Netherlands / North American Philips Co., Inc., New York / A magnetic shift register.

2,952,012 / George W. Rodgers, Albuquerque, N. Mex., John E. Althous, San Diego, Calif., and Davies P. Anderson, Gene R. Bussey, and Leslie H. Minnear, Albuquerque, N. Mex. / U. S. A. as represented by the U. S. Atomic Energy Commission / An analog-to-digital data converter.

September 13, 1960

2,952,407 / Eric Weiss and William S. Speer, Los Angeles, Calif. / The National Cash Register Co., a corp. of Maryland / A parallel adder circuit.

2,952,837 / Andrew St. Johnston, Buntingford, Eng. / I. B. M. Corp., New York, N. Y. / An electronic digital computing machine.

2,952,839 / Adolfo A. Capanna, Stamford, Conn. / Pitney-Bowes Inc., Stamford, Conn. / An electrical signal storage device.

2,952,840 / Desmond S. Ridler and Robert Grimmond, London, Eng. / International Standard Electric Corp., New York, N. Y. / An intelligence storage device.

2,952,841 / George E. Lund, Havertown, Pa. / Burroughs Corp., Detroit, Mich. / A logic circuit using binary cores.

September 20, 1960

2,953,774 / Ralph J. Slutz, Boulder, Colorado / U. S. A. as represented by the Secretary of Commerce / A magnetic core memory having magnetic core selection gates.

2,953,775 / Vernon L. Newhouse, Moorestown, and Noah Shmarja Prywes, Pennsauken, N. J. / R. C. A., a corp. of Delaware / A magnetic storage and counting circuit.

2,953,776 / Eli Blutman, Riverside, and Jacob M. Sacks, Corona, Calif. / U. S. A. as represented by the Secretary of the Navy / A photographic digital readout device.

September 27, 1960

2,954,163 / Robert H. Okada, Bryn Mawr, Pa. / Burroughs Corp., Detroit, Mich. / A transistor binary counter.

2,954,164 / Kenneth E. Schreiner, Har-

rington Park, N. J., Lowell D. Amdahl, Redondo Beach, Calif., and Byron L. Havens, Closter, N. J. / I. B. M. Corp., New York, N. Y. / A check digit monitoring and correcting circuit.

2,954,165 / George H. Myers, Mount Vernon, N. Y. / Bell Telephone Lab., Inc., New York, N. Y. / A cyclic digital decoder.

2,954,166 / Donald E. Eckdahl and Richard E. Sprague, Torrance, Willis E. Dobbins, Manhattan Beach, Bernard T. Wilson, Los Angeles, and Hrant H. Sarkissian, Pacific Palisades, Calif. / The National Cash Register Co., a corp. of Maryland / A general purpose digital computer.

2,954,167 / Roger B. Williams, Jr., Toledo, Ohio / Toledo Scale Corp., Toledo, Ohio / An electronic multiplier.

2,954,168 / James L. Maddox, Philadelphia, Pa. / Philco Corp., Philadelphia, Pa. / A parallel binary adder-subtracter circuit.

2,954,467 / Robert H. Hardin, Los Angeles, Calif. / Hughes Aircraft Co., Culver City, Calif. / A gating circuit.

2,954,481 / William F. Steagall, Merchantville, N. J. / Sperry Rand Corp., a corp. of Delaware / A free running digital multivibrator.

2,954,484 / Frank A. Hill, Van Nuys, and A. J. Pankratz, Glendale, Calif. / General Precision, Inc., a corp. of Delaware / A direct coupled transistor flip-flop.

October 4, 1960

2,954,926 / Loring P. Crosman, Wilton, Conn. / Sperry Rand Corp., a corp. of Delaware / An electronic data processing system.

2,954,927 / William Woods-Hill, Letchworth, Eng. / International Computers and Tabulators Lim., London, Eng. / An electronic calculating apparatus.

2,955,281 / Andrew E. Brennemann, Ralph B. DeLano, Jr., and Donald R. Young, Poughkeepsie, N. Y. / I. B. M. Corp., New York, N. Y. / A ferroelectric memory system.

October 11, 1960

2,955,755 / Robert S. Bradshaw, Broomall, Pa. / Burroughs Corp., Detroit, Mich. / An electromechanical storage transfer, and read-out device.

2,955,756 / Robert A. Jensen, Flushing, N. Y. / I. B. M. Corp., New York, N. Y. / A serial word checking circuit.

2,955,759 / Gerhard Wolf, Munich-Pasing, Germany / Kienzle Apparate G. m. b. H., Munich-Pasing, Germany / An accumulator for computing machines.

2,955,760 / George M. Berkin, Poughkeepsie, New York / I. B. M. Corp., New York, N. Y. / A relay arithmetic device.

2,956,175 / Theodore P. Bothwell, Collingswood, N. J. / R. C. A., a corp. of Delaware / A transistor gate circuit.

2,956,182 / Robert H. Norman, Glen Oaks, N. Y. / Sperry Rand Corp., a corp. of Delaware / A binary half-adder circuit.

October 18, 1960

2,957,104 / Richard M. Roppel, New Haven, Conn. / .... / An analogue to digital converter.

2,957,168 / Jack L. Dempsey, Morristown, and Roderick K. McAlpine, Summit, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A diode gate translator.

October 25, 1960

2,957,626 / Byron L. Havens, Closter, and Kenneth E. Schreiner, Harrington Park, N. J., Lowell D. Amdahl, Redondo Beach, Calif., John P. Cedarholm and Joachim Jeenel, New York, N. Y., Harley R. Meadows, Fort Wayne, Ind., and George E. Mitchell, Endicott, N. Y. / I. B. M. Corp., New York, N. Y. / A high-speed electronic calculator.

2,957,690 / Herbert E. Thompson, San Jose, Calif. / I. B. M. Corp., New York, N. Y. / A data storage access mechanism.

2,958,074 / Tom Kilburn, Urmston, and George R. Hoffman, Manchester, Eng. / National Research Development Corp., London, Eng. / A magnetic core storage system.

2,958,075 / Robert D. Torrey, Philadelphia, Pa. / Sperry Rand Corp., a corp. of Delaware / A shift register.

2,958,076 / Robert C. Kelner, Concord, Harrison W. Fuller, Boston, Harvey Rubinstein, Lynnfield, and Harold E. Lerner, Chelsea, Mass. / Laboratory for Electronics, Inc., Boston, Mass. / An electrical data synchronizer.

2,958,077 / Carl G. Svala, Alvsjo, Sweden / Telefonaktiebolaget L. M. Ericsson, Stockholm, Sweden / A magnetic register circuit.

November 1, 1960

2,958,465 / Byron L. Havens, Closter, N. J. / I. B. M. Corp., New York, N. Y. / An electronic adding circuit.

2,958,466 / Clayton D. Alway, Kalamazoo, Mich. / The Upjohn Co., Kalamazoo, Mich. / A computer circuit.

2,958,851 / Perrin F. Smith, Saratoga, Calif. / I. B. M. Corp., New York, N. Y. / A data processing system with synchronous and asynchronous storage devices.

2,958,852 / Howard M. Robbins, Los Angeles, Calif., and Harold R. Kaiser,

EMPLOYMENT OF COMPUTERS

"Remember the good old days when we could get five men for a bowling team?"

Woodland Hills, Calif. / Hughes Aircraft Co., Culver City, Calif. / A diodeless magnetic shifting register.

2,958,853 / Desmond Sydney Ridler and Robert Grimmond, London, Eng. / International Standard Electric Corp., New York, N. Y. / An intelligence storage device with compensation for unwanted output currents.

2,958,854 / Hewitt D. Crane, Palo Alto, David R. Bennion, Loma Mar, and Fred C. Heinzmann, Palo Alto, Calif. / Burroughs Corp., Detroit, Mich. / A multi-aperture core element design for magnetic circuits.

2,958,855 / Robert J. Froggatt, Norwood Green, Southall, and Nigel D. Robinson, Hillingdon, Eng. / Electric and Musical Ind. Ltd., Hayes, Eng. / A data storage device.

2,958,856 / Raymond Bird and John R. Cartwright, Letchworth, Eng. / International Computers and Tabulators, Ltd., London, Eng. / A magnetic storage system.

2,958,857 / Walter C. Johnson and John F. Brinster, Princeton, N. J. / General Devices, Inc., Princeton, N. J. / A multi-signal sampling circuit.

2,958,861 / Joseph Luongo, Cedar Grove, and Richard H. Rywer, Belleville, N. J., and Frank P. Turvey, Jr., Melbourn, Fla. / International Telephone and Telegraph Corp., Nutley, N. J. / An analog to digital translator.

November 8, 1960

2,959,283 / Donald H. Apgar, Binghamton, N. Y. / I. B. M. Corp., New York, N. Y. / A data comparing device.

2,959,351 / Francis E. Hamilton, Binghamton, and Ernest S. Hughes, Jr., and Warren K. Lind, Vestal, N. Y. / I. B. M. Corp., New York, N. Y. / A data storage and processing machine.

November 15, 1960

2,960,681 / Theodore H. Bonn, Philadelphia, Pa. / Sperry Rand Corp., New York, N. Y. / A transistor function table.

2,960,683 / Ralph A. Gregory, William Wolensky and Robert W. Murphy, Poughkeepsie, N. Y., and Charles T. Baher, Jr., Philip W. Jackson, and Wayne D. Winger, Wappingers Falls, N. Y. / I. B. M. Corp., New York, N. Y. / A data coordinator.

2,960,685 / Hendrick van der Heide, Eindhoven, Netherlands / North American Philips Co., Inc., New York, N. Y. / A magnetic switching device.

2,960,686 / Robert de Gaillard, 12 Rue Marbeuf, Paris, France / .... / A method of and device for recording and reproducing on magnetic carriers at any speed.

2,960,687 / Gerson H. Robison, North Merrick, N. Y. and John F. Dickson, Neptune, N. J. / U. S. A. as represented by the U. S. Atomic Energy Comm. / A coincidence occurrence indicator.

2,960,690 / Daniel L. Curtis, Manhattan Beach, Calif. / Litton, Inc. of Calif., Beverly Hills, Calif. / A computer input-output system.

November 22, 1960

2,961,609 / Robert C. Manring, Phoenix, Arizona / Motorola, Inc., Chicago, Ill. / A pulse width discriminator circuit.

2,961,610 / Hans A. Hosenthien, Fort Bliss, Texas / U. S. A. as represented by the Sec. of the Army / A reflected nonlinear modulator in alternating current electrical analog computers.

2,961,642 / Owen L. Lamb, Poughkeepsie, N. Y. / I. B. M. Corp., New York, N. Y. / A peak sensing circuit.

2,961,643 / William R. Ayres, Wichita, Kans., and Joel N. Smith, Westmont, N. J. / R. C. A., a corp. of Del. / An information handling system.

2,961,644 / Charles W. Gardiner, Manchester, Mass. / Laboratory for Electronics, Inc., Boston, Mass. / A data translating apparatus.

November 29, 1960

2,961,944 / E. Paul Anderson, Burlington, N. J. and James E. Guertin, Camden, N. J. / .... / A digital computer.

2,962,212 / Herbert A. Schneider, Englewood, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A high speed binary counter.

2,962,213 / Paul P. Namian, Asnieres, France / Societe d'Electronique et d'Automatisme, Courbevoie, France / An electric digital computer.

2,962,214 / Bernard M. Gordon, Newton, and Marshall M. Kincaid, Arlington, Mass. / Epsco, Inc., Boston, Mass. / A function generating apparatus.

2,962,215 / Munro K. Haynes, Poughkeepsie, N. Y. / I. B. M. Corp., New York, N. Y. / An arithmetic circuit employing magnetic cores.

2,962,216 / Bennett Housman, Arlington, Va. / I. B. M. Corp., New York, N. Y. / A binary adder circuit.

2,962,217 / Robert M. Landsman, Norwalk, Conn. / The Perkin-Elmer Corp., Norwalk, Conn. / A system of producing curves from pulse data.

2,962,601 / Hewitt D. Crane, Princeton, and Arthur W. Lo, Elizabeth, N. J. / R. C. A., a corp. of Delaware / A magnetic control system.

2,962,604 / Willard M. Brittain, Amherst, N. Y. / Westinghouse Electric Corp., East Pittsburgh, Pa. / A semiconductor logic circuit.

2,962,699 / Richard O. Endres, Collingswood, N. J. / R. C. A., a corp. of Del. / A memory system.

December 6, 1960

2,963,223 / Edmund H. Cooke-Yarborough, Longworth, near Abingdon, Eng. / U. S. A. as represented by the U. S. Atomic Energy Commission / A multiple input binary adder employing magnetic drum digital computing apparatus.

2,963,685 / George J. Laurer, Johnson City, and Carl D. Southard, Endwell, N. Y. / I. B. M. Corp., New York, N. Y. / A data storage apparatus and controls therefor.

2,963,686 / Arthur J. Spencer, Stevenage, Eng. / International Computers and Tabulators Lim., London, Eng. / A data storage apparatus utilizing cores of magnetic material.

2,963,687 / George R. Briggs, Princeton, N. J. / R. C. A., a corp. of Del. / A magnetic system.

2,963,688 / Hiroshi Amensiya, Haddonfield, N. J. / R. C. A., a corp. of Del. / A shift register circuit.

2,963,689 / Oscar B. Stram, Paoli, Pa. / Burroughs Corp., Detroit, Mich. / An input buffer for a magnetic step counter.

2,963,690 / Wesley A. Holman, San Jose, Calif. / I. B. M. Corp., New York, N. Y. / A write-wide, read-narrow magnetic transducer.

2,963,698 / George M. Slocomb, Altadena, Calif. / Consolidated Electrodynamics Corp., Pasadena, Calif. / A digital-to-analog converter.

2,963,699 / Thaddeus C. Burnette, Jr., Swannanoe, N. C. / Amul Propulsion

Inc., a corp. of Del. / An analog-digital converter.

December 13, 1960

2,964,238 / Kenneth O. Kling, Torrance, and Constantine M. Melas, Saratoga, Calif. / The National Cash Register Co., Dayton, Ohio / A card readout system.

2,964,242 / Ralph B. Brown, Ralph H. Beter, and James L. Maddox, Phila., Pa. / Philco Corp., Phila., Pa. / A binary computer circuit.

December 20, 1960

2,965,884 / J. Alvin Henderson, Fort Wayne, Ind. / International Telephone and Telegraph Corp. / A memory circuit.

2,965,886 / Darrell L. Mitchell, Charleston, N. H. / Ex-Cell-O Corp., Detroit, Mich. / A device for setting and locking magnetic transducer heads associated with a magnetic data storage device.

2,965,887 / John J. Yostpille, Livingston, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A multiple input diode scanner device.

December 27, 1960

2,966,304 / Leonard Roy Harper, Poughkeepsie, N. Y. / I. B. M. Corp., New York, N. Y. / An electronic computer.

2,966,305 / Gerald B. Rosenberger, Wappingers Falls, N. Y. / I. B. M. Corp., New York, N. Y. / A simultaneous carry adder.

2,966,306 / Jean G. V. Isabeau, Berwyn, Ill. / Zenith Radio Corp., a corp. of Del. / A computing apparatus.

2,966,307 / Hermann Schmid, Binghamton, N. Y. / General Precision, Inc., a corp. of Del. / An electronic computer circuit capable of four-quadrant operation.

2,966,599 / Isy Haas, Menlo Park, Calif. / Sperry Rand Corp., New York, N. Y. / An electronic logic circuit.

2,966,661 / Munro K. Haynes, Poughkeepsie, N. Y. / I. B. M. Corp., New York, N. Y. / An apparatus for transferring pulse information.

2,966,662 / Theodore H. Bonn, Philadelphia, Pa. / Sperry Rand Corp., New York, N. Y. / A gating circuit employing magnetic amplifier.

2,966,664 / Richard C. Lamy, Kenmore, New York / I. B. M. Corp., New York, N. Y. / A magnetic core flip-flop.

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